HEALTH-HABITS

BOOK TWO

Health-Happiness-Success-Series

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Health, Happiness, Success Series

BOOK TWO

HEALTH HABITS

PHYSIOLOGY AND HYGIENE

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Foreword

Health Education to-day is saner, broader, and more effective than ever before. It plans to reach its goals by slow, steady, persistent efforts, carried through all the stages of development, varying its content and methods to suit particular needs and interests. It takes note of the fact that everything has its health significance, and seeks to develop habits and ideals which will place even the effects of the commonest of every-day procedures upon the "credit" side of the "health ledger" and not have them turn up at a future time as "liabilities."

The intermediate and early upper grades, for which this text is written, are important ones in the matter of health education. The foundation in the development of health habits has been laid. The final outcome is often determined by the effectiveness or ineffectiveness of the work at this time. Account is therefore taken of the enlarging horizons of growing children. Reasons are introduced, often for the first time. Satisfied as to the soundness of these, the health practices, which were rather arbitrarily carried on before, are now likely to be more intelligently and, consequently, more effectively performed.

In this text, a persistent attempt has been made to enter into the various topics through an approach well within the common experiences and interests of the pupils. The facts of anatomical structure and physiological function have been chosen on the basis of their usefulness in explaining, strengthening, and encouraging the desirable hygienic practices. The material content has been written and arranged with a view to its teachable characteristics. From an easy and natural connection with a health practice already developed, or from a knowledge of the more familiar uses of various parts of the body, the pupils are led to the less familiar details of structure and function, and thence to the re-enforcement of hygienic practices already begun, or to the initiating of other desirable ones.

Foreword—Continued

This makes "doing" the goal, rather than "knowing," for it must be kept constantly in mind that well-developed habits, or ideals, are needed to turn the knowledge into account.

The "Helpful Things to Do" and the "Health Problems and Questions" at the end of each chapter will help materially in supervised study, and in pointing out many of the correlations that are possible in the field of health education. They make possible the strengthening of the health practices that comes with linking them up with the events of everyday life.

The illustrations are varied in their nature. Some are included to clarify explanations in the text. Others are presented to drive home, directly and indirectly, the fact that good health is not merely an end in itself, but is a key which opens the door to fullest participation in happy play, makes possible the joys of service, and enables one to become a desirable and useful member of the community.

Acknowledgments

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CHAPTER I

OUR CASTLE OF HEALTH

The solid, sturdy castle of olden times was built for strength. Its massive towers and walls protected the people from the assaults of their enemies. It allowed them to live in security within it.

A healthy body is our "castle." It secures to us the pleasures of a useful, happy life. It makes joyful occupations of work and play alike. It offers a strong defense against the attacks of illness and disease.

People thought about their bodies long before they understood their importance to health. Some thought they were things to be despised, and abused and neglected them. Others respected them above everything else and did all they could to strengthen and develop them. The ancient Greeks, for example, more than any other nation, admired the beauty of a strong and graceful body. Their sculptors have preserved in marble some priceless examples of the wonderful perfection to which the human body can be developed. The ancient Greek statue of the "Discus

Thrower'' reproduced opposite page 1, is one of the best of these.

Today we admire the grace and beauty of our bodies and understand better than ever the important part they play in everything we do.

The Parts of Our Body:

Our body is a wonderful machine. Its different parts all work together for us in many ways. In general, we think of the body as being made up of three principal divisions, or parts, called the *head, trunk,* and *limbs.*

The head is the upper part of the body. It is somewhat circular in shape, due to the form and arrangement of the bones which enclose and protect the brain. It also contains the eyes and ears, through which we learn of sights and sounds, and those ''gateways'' to the body called the nose and mouth. The front part of the head is called the face. Our ''looks,'' or appearance, is determined by the form and arrangement of its various parts.

The trunk is the central portion of the body. Its interior is divided into two parts by a broad, flat muscle called the diaphragm. The chest, or upper part, contains the heart and lungs. The abdomen, or lower part, holds the stomach, liver, kidneys, intestines, and other important organs.

The limbs form the extremities of the body, as they are sometimes called. The arms, wrists, hands,

and fingers make up the upper limbs and serve us in so many ways that it is quite impossible to state them all. The legs, ankles, feet, and toes comprise the lower limbs. It is these sturdy parts which support the weight of the body and transport us from place to place.

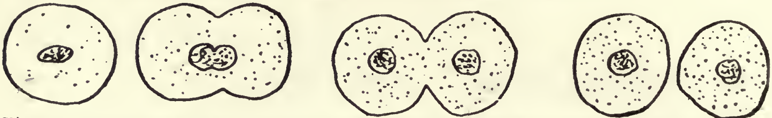
The "Building Stones" of Our Body:

At a distance, it is often impossible to see the separate bricks, stones, or boards of which a building is constructed. We must come closer in order to single them out. The "building stones" of our body are so tiny that they cannot be seen at all until, under a microscope, they are made to appear many times larger than they really are.

The body is made of millions and millions of tiny *cells,* each composed of a bit of living substance called *protoplasm.* The life-story of each little cell is very much like that of a tiny one-celled animal called an *amoeba.* As an amoeba floats in a drop of water under a microscope, it can be seen to move about, grow, and develop until it finally divides in half, making two complete cells where one had existed before. Each of these divides into two more and so on until a vast number can soon result. This gradual division into two cells is shown in the illustration on page 4.

The cells of the body group themselves in different ways to form the parts we call the *tissues.* Some

harden to form the bony framework which supports the body. Others arrange themselves into the long thread-like fibers which make the muscles, or form into the layers of the skin, or make the nerves, the blood vessels, and all the other parts as well.



TWO COMPLETE CELLS RESULT FROM THE DIVISION OF A SINGLE CELL

Other cells make up the *organs,* or the "workmen," of the body. They form the heart which helps to circulate the blood, the lungs which purify the air, the brain with which we think, the stomach and intestines which prepare the food for our nourishment, the kidneys which help to rid the body of its waste materials, and others like them.

Thus, strong and healthy cells make strong and healthy bodies. They reward us for supplying them with proper food and drink, fresh air and sunshine, exercise, rest, and sleep. They rebel against neglect and abuse and make us suffer in many ways for our ignorance or our carelessness.

Helpful Things to Do

1. Construct a "Castle of Health," using foods for the building stones and health habits for the towers of defense.

2. Examine an amoeba under a microscope if the

necessary materials can be secured. Watch one of them divide into two tiny, complete, one-celled animals.

Health Problems and Questions For Discussion

1. What three "rewards of health" are mentioned in connection with the comparison of a healthy body with a castle?

2. What ancient people admired the body for its beauty and grace?

3. In a general way, what are the divisions, or parts, of the body?

4. What parts of the body are located in the head? in the trunk?

5. What are the upper limbs? Of what uses are they?

6. What are the lower limbs? Name some of their uses.

7. Describe the way in which large numbers of cells are formed from a single cell.

8. Name some of the tissues of the body. Of what are they composed?

9. Name some of the organs of the body. Of what use is each? Of what are they composed?

10. In what ways do our bodies reward us for the care and attention we give them?

11. What are some of the effects of the neglect and abuse of our body?

CHAPTER II

THE SKIN AND PERSONAL CLEANLINESS

A clean, soft, smooth skin with a glow of pink showing through from underneath is a real source of pride and joy. It is one of Nature's ways of telling a person that he is healthy. What does Nature say about *you* in this respect?

A clean, soft, smooth skin is a prized possession.

It is so easy to keep the skin healthy and attractive looking that it is a great waste of time and of

money to depend upon artificial preparations and treatments for this purpose. Such things often harm rather than help the skin and handicap it in doing much of its important work.

Early Habits of Personal Cleanliness:

Keeping the skin clean is among the earliest health habits we were taught to form. Each of us can probably remember the time when we were cleaned and scrubbed with soap and water with great

regularity. Then as we grew older we were trusted more and more with the care of our own personal

appearance. Little by little we built up those habits of personal cleanliness which still help us to keep clean and neat.

During all these early years we knew little or nothing about our skin as a part of the body with several important duties to perform, but as a reward for our care it went on faithfully performing its share of the work of keeping us in health.

The skin has several uses. It is, first of all, a covering and a protection for the body. Then it helps the body get rid of some of its waste materials, it assists in the regulation of the bodily heat, and plays an important part in our senses of touch and temperature.

THE SKIN COVERS AND PROTECTS THE BODY

The skin covers the entire body in a very accommodating way. We find it rather tightly stretched over places like the soles of the feet and the palms of the hands. Over the knee, elbow, and other joints it is much looser in order not to interfere with their movements.

The skin protects delicate parts beneath it from injury. It also keeps out dirt and disease germs so long as it remains unbroken.

Pinch a little loose skin between the fingers. It feels so thin and delicate that you wonder how it can protect as well as it does. This becomes plainer when the skin is examined under a microscope and the

structure of its two different layers is more clearly seen.

The Outer Layer of the Skin:

The outer layer, or "scarf skin," or *epidermis,* as it is sometimes called, is the protective part. It is made up of layer upon layer of flattened, scale-like bits of skin. In order to give the greatest amount of protection where it is needed the most, this outer layer grows much thicker on places like the palms of the hands and the soles of the feet.

There is no feeling in this outer layer, or epidermis. This can be proved by pushing a needle through a thickened portion of it and finding that no pain is felt.

The under part of the epidermis contains tiny particles of pigment, or coloring matter. The amount and color of this pigment varies with the different races of the world and also among different persons of the same race. Exposure to the sun usually darkens the coloring matter and causes the sunburn or "tan" so common in the summer.

It is interesting to note that the outer skin is marked with numerous lines which run in many directions. It has been found that the design of these lines in the finger tips is different in each person and that their arrangement never changes, thus making them valuable for purposes of identification. The ink records and photographs of the lines in the

finger tips are the "finger-prints" that are used so much by police officials in identifying criminals and other offenders.

Finger-Prints—A Useful Means of Identification

The Inner Layer of the Skin:

The inner layer of the skin, or the *dermis,* or "true skin", is directly underneath the outer layer. This inner layer, as shown in the diagram, contains a network of nerves and blood-vessels, numerous oil glands, sweat glands, and the roots of the hair. Pain and bleeding both result when this layer is pierced or cut.

The Growth of the Skin:

New layers of skin grow from the inside, while tiny particles of "dead skin" fall off or are rubbed off its outer surface. These small bits of dead skin

can often be shaken from clothing which has been worn next to the body for some time. It is the decay of this dead skin which causes much of the unpleasant odor that occurs when the body is not regularly washed or the clothing not changed often enough.

Whenever the outer skin is rubbed off, new skin will grow rather quickly in its place. In such cases the injured part is quite sore to the touch until the new skin grows thick enough to protect the delicate nerves in the inner layer just beneath it. When large areas of skin are destroyed, by burns or other accidents, it is usually necessary to assist Nature in the replacement of the skin. Expert medical attention is always needed at such times.

A Clean Skin Gives the Best Protection:

The skin can keep dirt and disease germs out of the body so long as it remains uncut or unbroken. Cuts and wounds in a clean skin are likely to be less dangerous than in a dirty skin. Frequent use of soap and warm water is the best means of providing this protection. As an extra precaution always sterilize cuts and wounds to kill any germs that may be present.

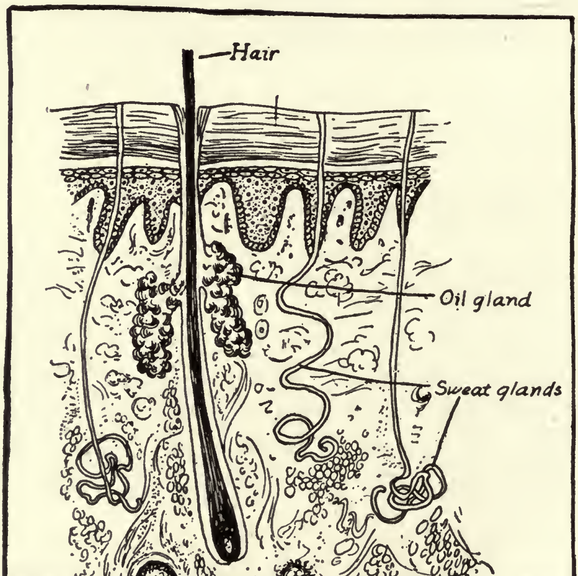
The Hair and Nails:

The hair and nails are really parts of the outer layer of the skin, which have grown in a way that

gives a special kind of protection to certain parts of the body.

The Hair. The hair grows on practically all parts of the body except on the palms of the hands and the soles of the feet. It is especially abundant on the top of the head where it protects against blows and sudden changes in temperature. The eye-lashes and eyebrows help to protect the eye from dust and other harmful things.

Each hair stands in a little pocket or hair "fol-



A cross-section of the skin as seen under a microscope. Are you not surprised to find so many different things contained within it?

licle" that folds down into the inner layer of the skin. Opening into this pocket are little glands which pour out an oily substance which keeps the hair moist, smooth, and glossy.

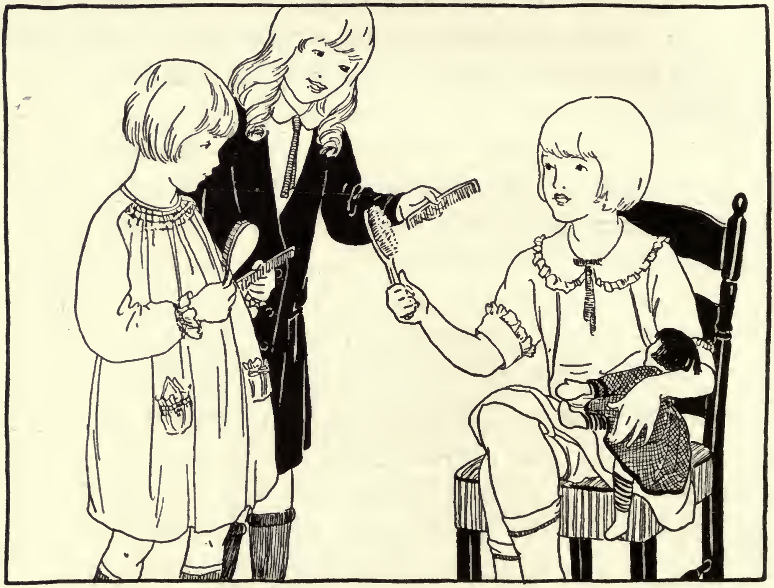
Care of the Hair. The hair is an ornament to the body, as well as a protection, and is well worth the trouble it takes to keep it in a healthy, well-cared for condition.

Because of its oily nature, the hair easily catches dust and dirt, and needs to be washed regularly. Some hair is more oily than others and needs to be washed more frequently. Washing too frequently, on the other hand, may make the hair too dry. Work out and follow a program which will keep your hair in a healthy condition. In a general way, about once a week may be suggested as often enough for boys to wash their hair, while once in one or two weeks will be best for girls. Warm water and a pure soap should be used for washing the hair. Rinse it in cool water and *dry it thoroughly* with a coarse towel.

Regular and vigorous brushing is good for the hair. This removes the particles of dead skin which become loosened from the scalp and get caught in the roots of the hair. Brushing helps the hair to grow by stimulating the scalp.

Use your own comb and brush and wash them frequently with soap and warm water. Scalp diseases and vermin are often caught by using combs and brushes other than your own. A quick and sure way

to remove vermin is to bathe the hair in coal oil or "kerosene," or in "lark-spur" (purchased at the drug store). Tie a towel over the hair at bedtime and then wash and comb thoroughly in the morning.



Betty, Jane and Mary each has her own brush and comb. Have you? And, by the way, do you keep them clean?

The Nails. The finger nails give protection to the ends of the fingers. The toe nails protect the toes. The nails grow from a root which is located in the inner layer of the skin, and so long as this root is not injured, or destroyed, the nails will continue to grow.

Care of the Nails. Keep the nails clean. Dirt and germs easily collect under them. A good habit to form is to clean the finger nails each time you wash the hands. Use a soft wooden "orange stick" or nail scrub for this purpose.

Well trimmed nails are easy to keep clean and add greatly to one's appearance. Do not trim them too close. Round the finger nail off to follow the shape of the fingers and cut the toe nails straight across. Biting the nails is a bad habit which should be stopped just as soon as possible. It causes the flesh to roll back over the finger nails, makes stubby unattractive looking fingers, and even causes painful sores.

THE SKIN HELPS THE BODY GET RID OF WASTE MATERIALS

You have noticed over and over again that hard work or play in hot weather or in a heated room makes drops of water come out upon the surface of the skin. This moisture, called perspiration, or sweat, is secreted by sweat glands found in the inner layer of the skin.

Each sweat gland, as shown in the illustration on page 12, is arranged like a little coil with a tiny tube reaching out to the surface of the body. The openings of these little tubes are called the *pores* of the skin.

Some moisture is passing out of the body all the

time. It comes out in such small amounts, as a usual thing, that it disappears, or evaporates, into the air before it can collect into drops large enough to be seen. The total amount, however, is quite large—from two to three pints or even more passing out through the skin each day.

Keep the Pores Open:

The work of the skin in removing waste materials from the body is extremely important. For this rea-

Play hard. A little "perspiration" may be all that is needed to win. (Don't forget to put on a sweater at the close of the game.)

son, the pores must always be kept open. The whole body needs washing with soap and warm water at least once a week, or even oftener, to prevent these little openings of the sweat glands from getting clogged up with dust and solid particles of waste matter that are left behind when the moisture evaporates. Certain parts of the body, like the hands and face, need much more frequent washing to keep them clean.

It is beneficial to work, play, and exercise so that the perspiration flows freely. This exercises the sweat glands and helps to keep them active.

We must drink plenty of water to replace that which the body loses in the perspiration. We take in some water in our foods, but it is usually necessary to drink several extra glasses each day to supply all that is needed.

THE SKIN HELPS TO REGULATE THE BODILY HEAT

The temperature of the inside of our bodies remains always at about 98.6 degrees, Fahrenheit, except, of course, when it is disturbed by illness and disease. How does this compare with the out-door temperatures at different seasons of the year?

Heat is made in the body by the burning, or using up, of the food we eat and by our bodily movements. The amount of heat that is produced changes from time to time. Some foods produce more than others

and the more vigorous the exercise, the greater the amount of heat that results.

When there is too much heat produced within the body, the excess must be eliminated, and when there is likely to be too little, the bodily heat must be conserved. The skin plays an important part in this work, as follows:

(1) *When there is too much heat within the body, the blood-vessels in the inner layer of the skin become larger.* This brings a greater amount of blood close to the surface of the body and allows some of the extra heat to pass through the skin into the outside air.

On the other hand, when the body wishes to keep all the heat it has and lose as little as possible into the outside air, these blood vessels become smaller. The least possible amount of blood then comes near the surface of the body and less heat is lost.

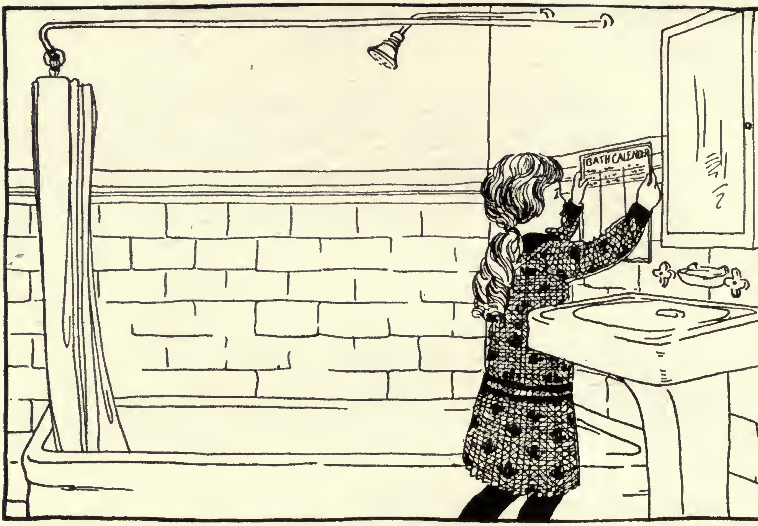
(2) *The disappearance, or evaporation, of perspiration into the air uses up bodily heat.* A part of the heat that is needed to make this moisture disappear into the air is taken from the body. You can prove this by wetting your finger or the back of the hand and blowing upon it. The moisture disappears rapidly and a very definite feeling of cold results from the quick loss of heat from the skin at that place. Why do people fan themselves in hot weather?

How to Assist the Skin in the Regulation of Bodily Heat:

Keep the pores of the skin open so that the perspiration will flow freely. Frequent use of soap and warm water is all that is necessary to do this.

Wear the proper kind and amount of clothing. In hot weather, wear clothing that will permit the heat of the body to escape through it easily. In cold weather, wear enough of the right kind of clothing so that too much of the bodily heat will not escape into the outside air. The next chapter will explain the proper kinds of clothing for the different seasons of the year.

Form the habit of taking cold baths if they are found to agree with you. Many people gradually accustom their skin to a cold plunge, or shower bath or tub bath taken regularly each morning. They do not begin at once with very cold water. They start with cool or even slightly warm water and make it a little colder each day until their skin can stand the shock of the cold without feeling uncomfortable. This is the same principle by which the face gets used to cold water. This kind of bath is not taken for cleanliness but for the stimulation it gives to the skin. It helps to strengthen the blood vessels in the skin which have so much to do with the regulation of the temperature of the body. Another important benefit which results from regular cold baths is the ability it gives the skin to withstand a sudden change



Post this "Bath Calendar" in your bathroom:

Kind of Bath	*When*	*Why*
Warm Tub Bath	Once or twice a week just before going to bed	For cleanliness
Cool "plunge" or "shower"	Every morning	An invigorating tonic

of temperature, which so often happens when you go from a heated house right out into the cold air. This is valuable in preventing colds.

THE SKIN IS THE ORGAN OF TOUCH AND TEMPERATURE

Little nerve endings in the inner skin help us to tell when things are hard or soft, rough or smooth, etc. These nerve endings are found all over the body and are especially numerous in the finger-tips. Blind people train the sense of touch in the finger-tips so well that they use it for many things we do with our sight. They read specially printed books by running their finger-tips over the raised letters.

Other nerve endings in the skin help us to know when things are hot or cold. Like the nerve endings of touch, they are found all over the body and warn us of possible dangers from extremes of temperature.

A HEALTHY SKIN

You may have heard the expression that a boy or girl is the "picture of health." This compliment is based largely upon the appearance of the skin. Such a skin is clear, smooth, and soft, with a pinkish glow showing through from underneath. This color is the way the free and easy circulation of the blood in the inner skin looks as it shows through the outer layer. Such a skin also proclaims to everyone that the health rules which apply to the care of the skin are being followed regularly.

SOME SKIN DISORDERS AND BLEMISHES

"Blackheads" show as tiny black spots in the skin. They are caused by allowing the oil and dust to

gather and remain in the pores of the skin until they harden and fill them up. They can be removed by gentle pressure or squeezing and can be prevented by more regular habits of cleanliness.

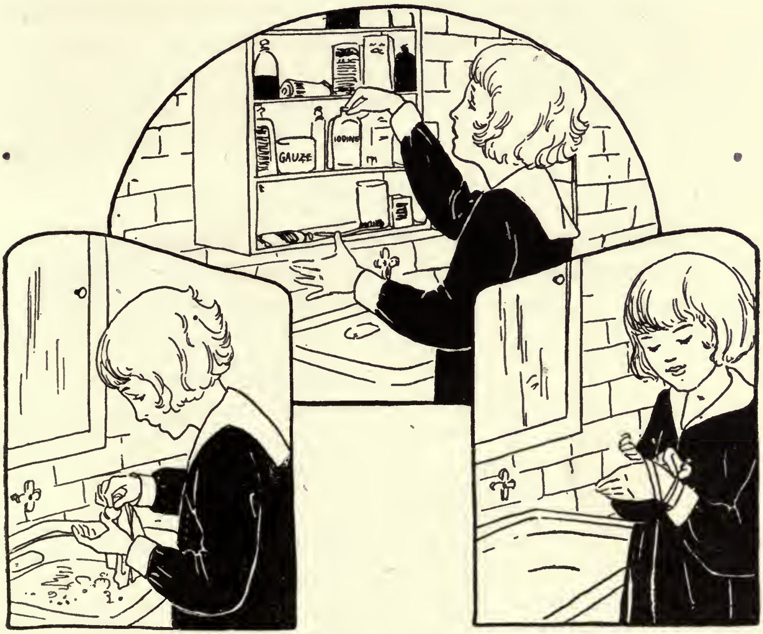
Pimples are frequently a sign that the health of the whole body needs building up. Give more care to the selection of your foods, and establish regular habits to remove the body wastes.

A "chapped" skin is rough, reddened, and easily cracked. It is often caused by going out into cold, damp, or windy weather without thoroughly drying the hands or face after washing. The moisture on the skin and the weather both prevent the oil from spreading over the skin. Chapped skin can be relieved and cured by supplying the missing oil. Gently rub a pure cold cream or vaseline into the skin until it regains its natural softness and color.

INJURIES TO THE SKIN

Cuts and wounds are dangerous because they allow dirt and disease germs to gain an entrance to the body. Therefore wash the cut thoroughly to remove the dirt, and then apply an antiseptic to kill the germs. Iodine or other effective antiseptic, or germ-killing solution, should be near at hand for emergencies. Do not cover a cut tightly with plaster, bandage, or other covering which will prevent the free circulation of air around it. Loose sterile gauze bandages are sufficient to keep out dust and dirt and allow the air to reach it as well.

Burns are among the most painful accidents that occur. The pain can be relieved before the doctor arrives by covering the burn with baking soda, boric acid ointment, glycerine, vaseline, lard, or an oil, like salad oil, or olive oil, or castor oil.



HOW TO TREAT A CUT

1. Wash out the dirt with warm water.

2. Dry thoroughly—sterilize with iodine or other suitable substance to kill all germs.

3. Wrap loosely with gauze bandage to keep out dirt.

Do not put bandages or coverings on a burn in such a way that they will be likely to stick to it for they will cause great pain and trouble when removed.

Helpful Things to Do

1. Examine the protective coverings of fruits like the apple, orange, or banana; also the coverings of nuts like the walnut, almond, or hickory nut. To which layer of our own skin do they correspond? Can you think of reasons why some are thicker or harder than others? Why is the protective layer of our skin thicker in some places than others?

2. Wet your hand. Blow upon it or wave it in the air until the moisture disappears or evaporates into the air. Notice how much cooler it feels. Does it feel cooler when you blow harder or move it more quickly? The evaporation of perspiration from the surface of the body cools the skin in the same way. Why do people fan themselves in hot weather? Why do thoughtful drivers dash water on their horses' heads in very hot weather?

3. Ink the tip of the forefinger on a pad. The kind used for rubber stamp will serve for the purpose. Press the finger firmly upon white paper. Compare your finger print with those of your classmates. Are any two exactly alike? Why are fingerprints used in the identification of criminals or other offenders?

4. Write slogans, or statements, which will call attention to the necessity and advantages of clean hands, face, neck, ears, and of bathing the whole body. Use these, together with original drawings

or cut-out advertisements, to make personal cleanliness posters. Include the following "Health Rules":

Wash the hands before meals.

Wash the hands, face, neck, and ears before going to school or other place where you will be expected to be clean and make a neat appearance.

Wash the hands, face, neck, and ears whenever they are dirty.

Take a bath (soap and warm water) oftener than once a week.

Health Problems and Questions for Discussion

1. What is meant by "Personal Cleanliness?"

2. Discuss the value and importance of each of the following essentials for a healthy skin.

   Cleanliness
   Proper food
   Regular elimination of the waste materials of the body

3. How many layers has the skin?

4. What are the important differences between the outer and inner layers of the skin?

5. Make a list of places where the outer skin is thicker than usual. What are the advantages of having it thicker at these places?

6. Name four different things that are found in the inner skin.

7. Why does the skin become pink or red in color when rubbed vigorously with a coarse towel?

8. Discuss the different purposes and values of hot and cold baths.

9. Why is it best to take hot baths just before going to bed?

10. Why is the morning the best time to take a cold bath?

11. What is the use of the oil that is poured out on the skin?

12. What are the pores of the skin? Why is it important to keep them open?

13. Why should everyone use only his or her own comb and hair brush?

14. How can you prevent chapped hands and face? What is the proper treatment for chapped skin?

15. Why is it so important to wash and sterilize cuts and wounds immediately?

16. What first aid treatment would you use for burns?

17. What is a blister? How is it formed? Why is the skin tender and sore for a while when a blister is formed?

CHAPTER III

CLOTHING AND ITS CARE

Many kinds of material are used for clothing. In some places, it is made from the materials found closest at hand, while in others, the products of the whole world are called upon to satisfy the tastes and desires of the wearers.

Clothing varies greatly in style and arrangement. Individuals display personal tastes in their choice of colors and styles. Nations as a whole frequently follow characteristic customs in the selection and arrangement of their native dress.

In spite of all the differences that are found in the choice of materials used and in the variations in the style and arrangement of these materials, people all over the world wear clothing for about the same purposes. These purposes or uses of clothing can be summed up as follows:

(1) To cover, adorn, and protect the body.

(2) To help in the regulation of the heat of the body.

CLOTHING AS A COVERING FOR THE BODY

With the exception of savage tribes in very hot climates, most peoples of the world keep the body fully clothed for purposes of decency and good taste. The form and arrangement of this covering varies

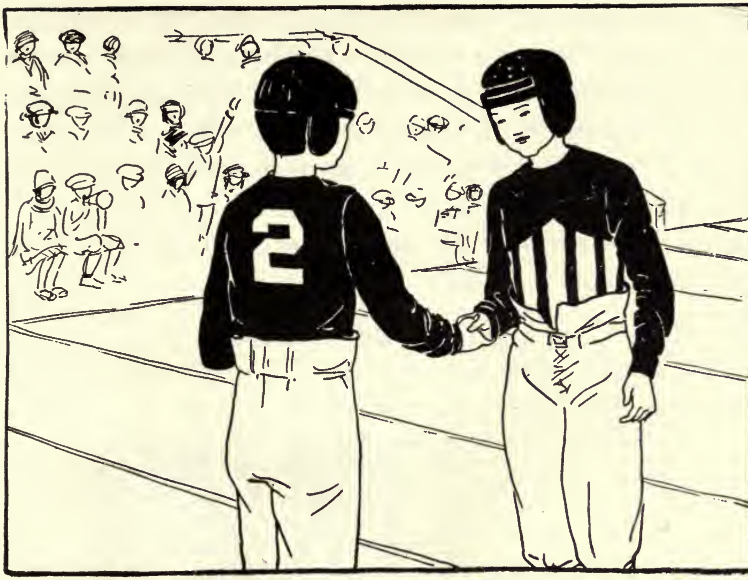
then according to the desires of the individual or the nation. The greatly adorned garments of the Indian Chief are in marked contrast to the plain and severe lines of the clothing of the Friends, or Quakers. All degrees of adornment can be found between these two extremes.

Clothing also serves to protect the skin from numerous bruises and injuries. This value of cloth-

Indian Chief in full ceremonial costume.

Note the elaborate adornment used by the Indians.

Quaker friend of Wm. Penn. Note plain, simple, unadorned nature of his clothing.



Football uniforms are designed to give the greatest possible protection during this strenuous game.

ing is very well understood by athletes who play in some of the more vigorous and active games. These players are careful to dress for such games in clothing specially designed to give the body the greatest possible protection against bruises and other forms of injury.

CLOTHING AIDS IN THE REGULATION OF THE HEAT OF THE BODY

Clothing does not make heat but it does help in the regulation and control of the heat of the body. There

are four materials most commonly used for clothing: *wool, cotton, linen,* and *silk.* All four of these do not serve equally well when it comes to the keeping out or the keeping in of heat and cold. Some allow heat to pass through them much more easily than others. This makes it quite important to know which are best suited for wear in cold weather and which should be selected when it is hot.

The Best Clothing for Cold Weather:

Wool is the best material for winter wear because it keeps the body heat from passing through it too

A light weight woolen sweater under a heavier garment keeps the body warm.

rapidly. To some people, woolen underwear is not so comfortable as cotton, so in very cold weather they often wear a thin cotton garment next to the skin and another thin woolen one over it. Wool is excellent for outer clothing also. It wears well and is made up in such a variety of colors, patterns, and styles that all tastes can be suited.

To get the greatest warmth from a woolen sweater it should be worn under another garment. The sweater is loosely woven so that a large amount of air can be kept in the spaces between the threads. Air is also a poor conductor of heat so that this combination of loosely woven wool and of air spaces makes the sweater valuable for winter use when worn properly. As sweaters are designed chiefly for outdoor wear they should be removed when indoors.

Clothing for Hot Weather:

Clothing for hot weather should be of such a kind that the bodily heat will pass out through it easily. *Cotton, linen,* and *silk* are the best materials for summer wear because they are thin, light in weight, and allow heat to pass through them readily. White and other light colors are cooler for summer wear than black and the darker colors.

Amount of Clothing Needed:

The heating systems in many homes today are much better than they were years ago. It is now

possible to keep rooms at a comfortable temperature even in quite cold weather. Where such is the case, too much clothing should not be worn indoors. Get the extra protection that is needed out of doors by putting on extra outer garments that can be removed easily upon reentering a heated room.

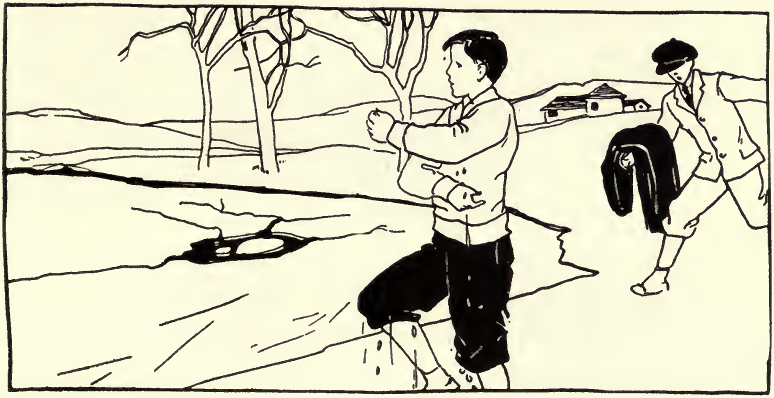
Do not bundle up the neck and face in furs, scarfs, and other coverings in cold weather. These parts will become used to the cold if they are given a chance. They will then be able to withstand the rapid changes of temperature that occur in going in and out of doors in cold weather. This will greatly lessen the chances of taking colds.

Wet Clothing:

Heat passes very easily through water. Wet clothes next to the skin permit the bodily heat to pass out rapidly into the air. This rapid loss of heat weakens the power of the body to resist disease and makes it easier to get sick. This is why the wearing of wet clothing in cold weather so often leads to colds, or pneumonia, unless certain precautions are taken to prevent their development.

To prevent the ill effects of wet clothing it is necessary to change to dry clothing as soon as possible. Suppose, however, that dry clothing cannot be secured at once. Then begin immediately to make more heat inside the body to take the place of that which is being carried rapidly off through the wet

clothes. Walk rapidly or run; swing the arms vigorously around and around; keep exercising until dry clothing is obtained and the body feels warm again.



After the rescue. Exercise vigorously to keep warm.

Remember that the clothing next to the skin is usually wet from perspiration after a vigorous game. Do not sit or stand around quietly in this condition without putting on a sweater or other wrap. This extra covering will check a too rapid loss of bodily heat and will likely prevent the catching of a cold at such a time.

Raincoats, overshoes, and rubber boots are articles of clothing specially made for wet weather. The rubber keeps out the moisture but prevents the cir-

culation of the air through it at the same time. They should always be taken off immediately after going indoors.

CARE OF CLOTHING

It is necessary to change and wash underclothing more often in summer than in winter because of the greater amount of perspiration given off by the body in hot weather. Much of this is absorbed by the underclothing. Put on clean underclothing after a bath. A clean body should have clean clothes. A full bath once a week should mean a change of underclothing at least once a week as well.

You do not always have to wear new outerclothing nor the most expensive materials to look neat. Clothing not only lasts longer, but looks neater when it is kept clean. Many outer garments can be washed and ironed; others can have spots removed and be pressed regularly to keep them neat.

Clothing will last longer if it is well cared for when not in use. Hangers of various kinds are very cheap and easy to use and can be made at home with very little effort. They well repay for their use in cleaner and neater clothes.

Winter clothing should be cleaned and stored during the summer. The summer clothing should be taken care of in winter. Be careful of moths when clothes are not in use.

Which Dress Shall I Wear?

WEAR CLOTHING PROPERLY

It is not enough that clothing be made of the proper materials and suited to the season of the year, but it should be worn properly as well. Tight clothing causes pressure which interferes with the natural growth and work of different parts of the body. Tight waistbands and belts are especially harmful. Circular, elastic garters interfere with the circulation of the blood. Shoes should fit the shape of the foot and be of proper size to prevent the foot from being forced out of shape. Ill-fitting shoes also cause painful corns and bunions to grow.

Helpful Things to Do

1. Examine the weave of samples of cotton and woolen goods. Pick the samples apart if possible. Which are the most loosely woven? What is an advantage of a loosely woven garment in winter when worn under another article of clothing?

2. Collect pictures showing the types of clothing worn in different parts of the world. Discuss the advantages of each type of clothing for the climate in which it is worn.

3. Demonstrate the proper ways to care for outer clothing when it is not in use. Discuss and demonstrate the easiest and most effective ways of removing spots from clothing. What are some of the dangers to avoid in using some of the most common cleaning materials?

Health Problems and Questions For Discussion

1. What is meant by *style* in clothing? Can you mention cases where the following of the style is not in keeping with the best possible care of the health of the body? In such cases which is the more sensible thing to do—preserve your health or follow a temporary style or fashion?

2. What three materials are best suited to summer wear? Why? Which material is best for winter wear? Why?

3. How does a room become heated from a radiator located in the room? Think of your body as a source of heat like the radiator. What prevents the heat of the body from passing out too rapidly into

the air? Does this help you in understanding the request that you should suit or adapt your clothing to the season of the year?

4. Why are white and other light colors chiefly used for warm weather clothing?

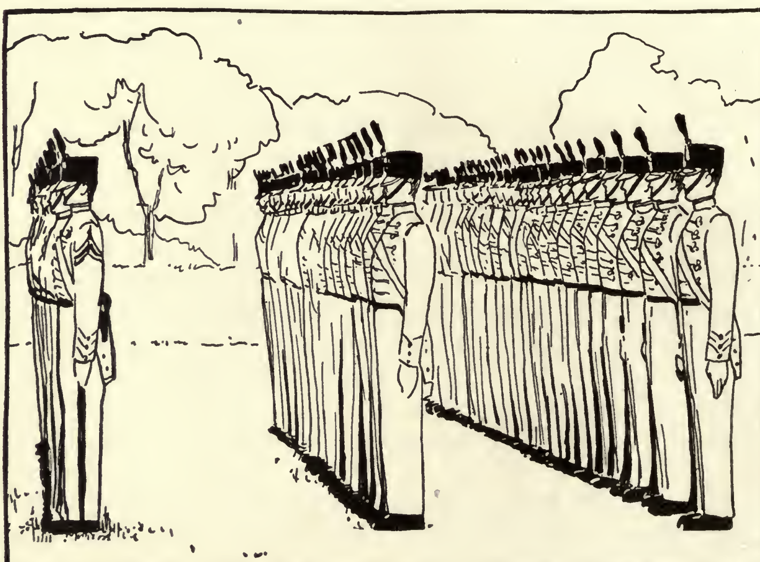
5. Why should underwear be changed and washed even more frequently than outer clothing?

6. How can you prevent destruction of clothing by moths? Look up the life history of the clothes moth to find out just why clothing is destroyed by moths.

CHAPTER IV

THE BONES AND THEIR JOINTS

The soldiers on this page are students in the United States Army Officer Training School at West Point, New York. They are the finest trained and drilled young men in the world. Notice how straight and tall each stands. How to stand erect is an important part of their training and depends upon the proper growth of the bones of the body and upon the training of the muscles which hold them in their places.

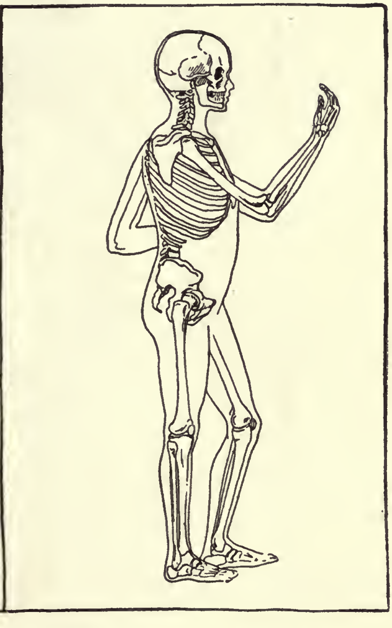


West Point Cadets "On Parade"

THE BONES MAKE A FRAME-WORK FOR THE BODY

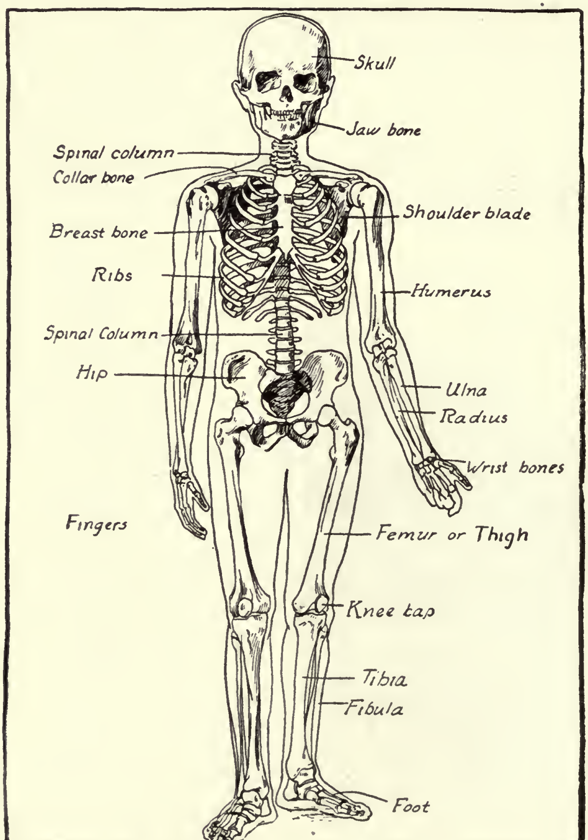
The construction of a building is the best illustration of this use of the bones. The builder puts up a framework of wood, iron, or steel to support the weight of the structure and to hold it up. The straighter and stronger this framework, the firmer and more substantial will be the finished building. So with the body, the straighter and stronger the bony framework, the more erect it can stand and the

Steel framework of a "sky-scraper."



Bony framework of our body.

steadier it can support the weight of the different parts. The illustration on this page shows the arrangement of the bones which form the human skeleton.



Framework of the human body

Parts of the Skeleton:

The bones which make up the skeleton, or bony framework of the body, can be divided conveniently into three groups, as follows:

(1) *The bones of the head.* This group includes the bones which make up the box-like structure we call the skull, and also that freely movable bone which forms our lower jaw.

(2) *The bones of the trunk.* These include the spinal column, or backbone, the ribs, and the breast bone.

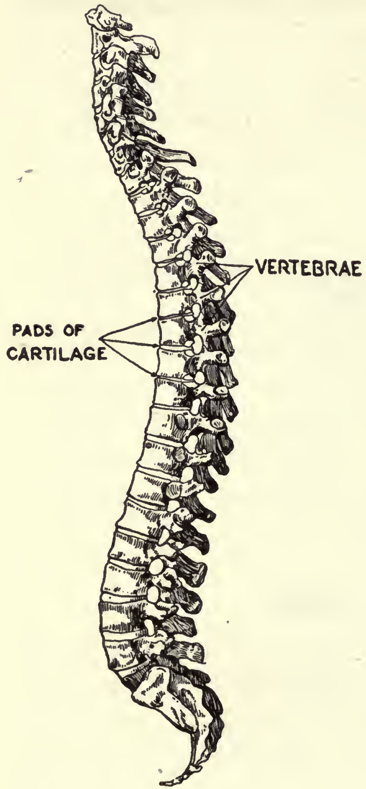
(3) *The bones of the upper and lower limbs.* Note that the collar bones and the shoulder blades help to form the attachments for the bones of the upper limbs while the hips serve in a similar manner for the bones of the lower limbs.

Importance of the Spinal Column:

In the arrangement of the bony framework of the body, the spinal column, or backbone, has a most important position. It stiffens the trunk, supports the weight of the body, and forms a place for the attachment of the ribs and the bones and muscles which support the upper and lower limbs.

This spinal column is made of a number of small bones called vertebrae. Between each two vertebrae is a little pad of spongy material called cartilage. These little cushions of cartilage absorb many of the shocks

and jars that the body receives. They also enable the spinal column to bend with the body.



Backbone, or spinal column. The pads of cartilage between the vertebrae absorb shocks and jars.

THE BONES PROTECT DELICATE PARTS OF THE BODY

The bones are hard and protect many softer parts of the body from injury. The bones of the skull enclose and protect the brain. The bones of the trunk

protect the heart, lungs, stomach, and other important organs located there. The bones of the spinal column protect the delicate spinal cord which passes through them.

THE BONES AFFORD PLACES FOR ATTACHMENT OF MUSCLES

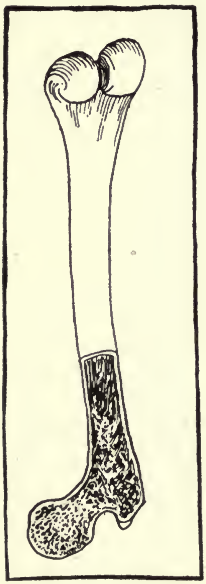
The muscles of the body are fastened to the bones. The bones give a solid foundation or support against

Bones afford places of attachment for muscles. This diagram shows the muscles attached to the bones by tendons.

which the muscles can pull in order to move the various parts of the body.

COMPOSITION OF BONES

Bones are composed of animal and mineral matter. Each of these materials has a special value in helping bones to do the work for which they are intended. The amount of animal and mineral matter in bones is not the same at all ages, and results in some interesting differences between the bones of the old and young.



Vertical Section of a Long Bone Cut to Show Marrow. Note the hollow interior filled with marrow.

Many bones have a hollow space in their interior, filled with a soft, spongy substance, called *marrow*. This marrow contains the nerves and blood-vessels with which the bones are supplied. It can be seen

plainly in bones in meat purchased for the table. Its red color before cooking indicates the presence of blood vessels in the bone.

Animal Matter Makes Bones Tough and Flexible:

The bones of young people contain more animal matter than mineral matter. This makes the bones softer and more easily bent. They do not break so easily. This is a fortunate thing when you think of all the jars and falls that happen to young people in the course of their very active lives.

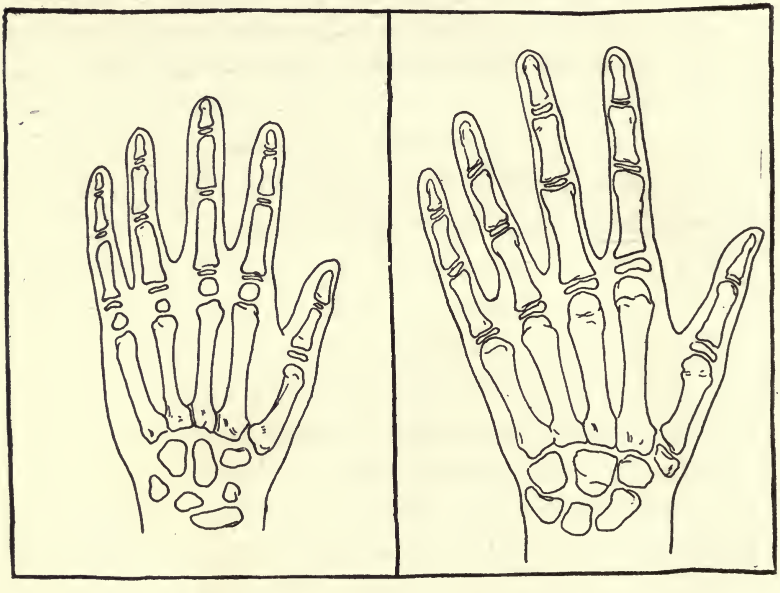
There is an interesting experiment which shows the use of the animal matter in the bones. Put a chicken bone, for example, into some muriatic or nitric acid. (*Caution*: These acids are strong poisons and must not be permitted to touch the skin, clothing, or anything else round about.) After two or three days, remove the bone, wash it carefully, and you will find that it can easily be twisted, or bent, in all directions or even tied into a knot. The acid has eaten out all the mineral matter and left only the animal matter.

Mineral Matter Makes Bones Hard and Strong:

As the years go by, the amount of animal matter grows less and the amount of mineral matter increases until there is much more mineral than animal matter. As this occurs, the bones become harder and

stronger, giving better protection and making firmer supports where needed.

They are more likely to break, however, when subjected to sudden jars, or blows, because they can no

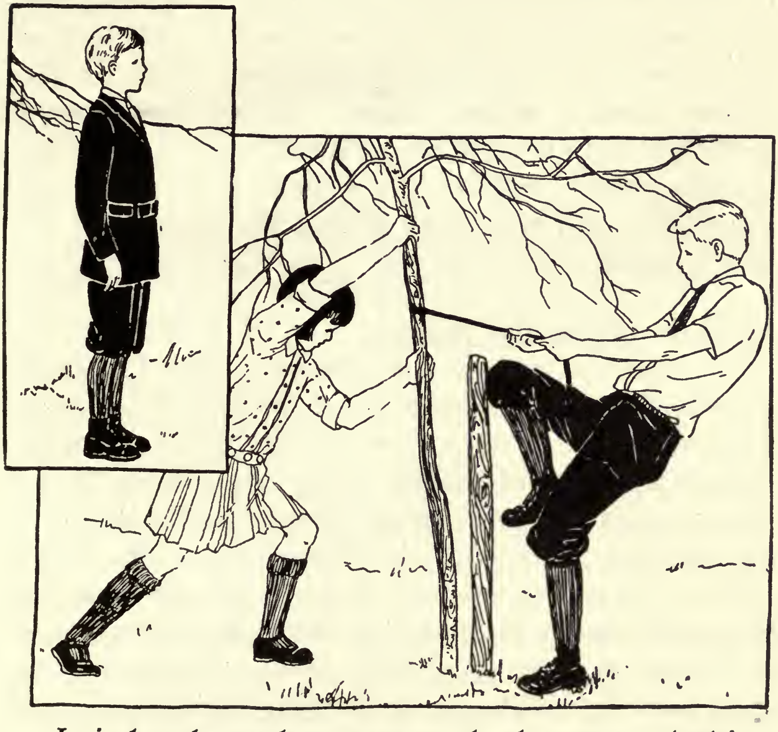


The X-Ray picture on the left shows the wrist bones of a young child. Those of an older child are shown on the right. Note the increase in the growth and development of the bones.

Milk, vegetables, cereals and fruits contain calcium, or lime, which bones must have in order to grow properly.

longer bend as they could when there was a larger amount of animal matter in them.

There is also an experiment to show the presence of mineral matter in the bones. Place a bone in a hot fire and burn it for several hours. After it cools it



It is hard work to correct bad posture habits, even of trees.

How much easier it is to form good posture habits at the start.

can easily be crumbled into powder. The fire has burned out all the animal matter and left only the mineral parts.

GROWTH OF BONES

Bones grow both in size and strength. The food materials needed for this growth and development are brought to the bones by the blood vessels located in the marrow, or spongy substance, found in the hollow interior of most bones. During the years of growth, it is important to eat foods which supply the needed mineral matter to the bones. *Milk, cereals, vegetables,* and *fruits* are among the best foods for this purpose.

Posture Affects the Bones:

The bones of young people bend easily. Incorrect positions of the body at this age are even more dangerous than later in life because of the ease with which the bones of young people are forced out of their natural shapes. Great care must be taken to correct any unnatural conditions before the bones have a chance to stiffen, or harden, into bent or twisted forms by the gradual substitution of mineral for animal matter. It is just as easy to cause them to grow into correct shapes by forming habits of proper standing, sitting, and walking positions at the very beginning as it is to allow them to become bent and crooked. Gardeners often straighten crooked young trees by tying them in certain positions until they

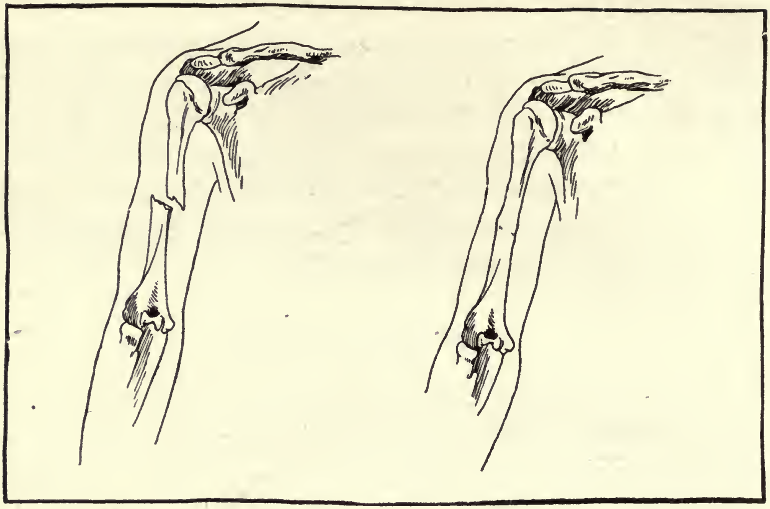
grow in the desired direction. In the same way our bones will grow into correct shapes if we will train our muscles to hold the bones in the proper positions.

Tight clothing also causes bones to grow incorrectly. Pressure upon the chest will force in the ribs and produce a flattened chest. Improperly shaped shoes will deform the bones of the feet.

BROKEN BONES

Broken bones will heal themselves if the two ends are brought together and kept from moving for a sufficient length of time. A cement-like substance forms on each end of the break where it gradually hardens until the mended bone is usually as strong as it was before. It is most important that the broken ends be brought together evenly so that the bones will not be crooked after the break has healed. A doctor is needed to "set" the bones, and it is a good plan also to have an "X-ray" picture taken immediately after the bones are set in order to see if they are in their correct positions. Many needless deformities can be prevented by such precautions.

In first aid treatment of broken bones it is best not to move the patient any more than can be helped until the doctor comes. The edges of the broken bones are very sharp and will cut right through the flesh and make the wound much more serious unless great precautions are taken to prevent it.



X-Ray picture of broken bone before setting. The edges of the break are sharp and care must be taken to prevent them from cutting through the skin.

X-Ray picture after broken bone is set. Why should an X-Ray picture always be taken after a broken bone is set?

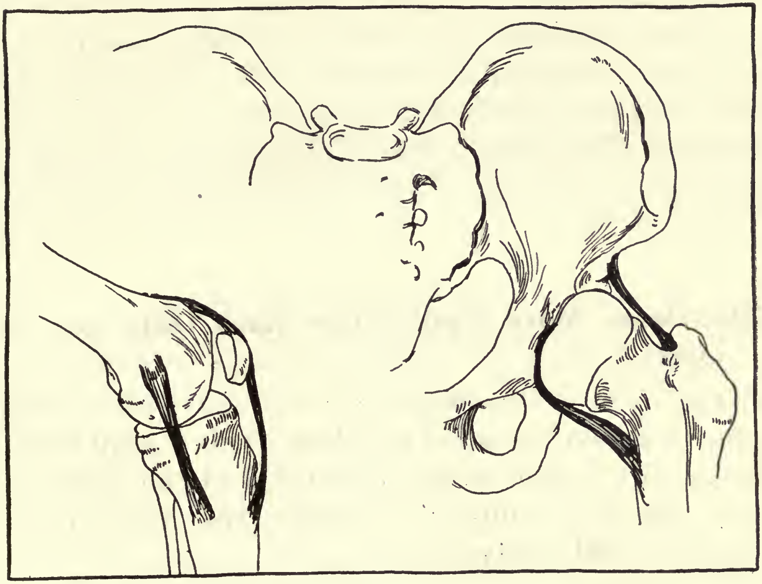
HOW THE BONES ARE JOINED TOGETHER

Bones are arranged and joined together in a manner which permits parts of the body to move in certain directions. The places where the bones are joined are called *joints.*

Kinds of Joints:

Joints are named according to the kind of motion they allow. For example, the elbow and knee are

called hinge joints because their movement is like that of a hinge. The bones at the wrist and ankle are joined in a similar way. The joints at the shoulder



The knee is a hinge joint. Where are other hinge joints?

The hip joint is called a ball and socket joint. Do you not think it is well named? Where are other ball and socket joints?

and hip allow more motion than the elbow or knee. These are called ball and socket joints, because the rounded end or ball of one of the bones fits snugly into a hollow depression, or socket, in the other and

thus permits the circular motion needed at these parts. The head is joined to the spinal column by a rotary joint which allows a circular, or rotary, motion of the head.

There are other joints which allow no motion at all, and are called immovable joints. The bones of the skull are tightly joined together in a way that does not allow them to move. This gives the strongest possible protection to the delicate brain which is located within.

The Bones Move Easily Over Each Other at the Joints:

The ends of the bones are covered with a soft, smooth substance called cartilage. This is kept moist by an oily liquid, which is secreted at the joints in just the right amount to make the bones move smoothly and easily.

Ligaments:

The bones are held together at the joints by tough, non-elastic bands or cords, called ligaments. These ligaments are very strong and hold the bones firmly in place. Occasionally, however, a hard fall or blow will pull one or more of the bones out of place and a dislocation or sprain results. Such accidents are quite painful, and in severe cases the ligaments themselves may be torn from the bones. Sprains and dis-

locations should be given expert medical treatment to prevent improper healing.

Helpful Things to Do

1. Examine pieces of bone taken from fresh meat. Select those that show the ends as well as a cut across the bone. Note the great strength of the bone. Why are the ends which form joints with other bones so smooth? Are the ends of a fresh bone dry or moist? Why? Can you find pieces of ligaments still attached to the bone? If you can find a piece long enough, test it for its strength.

In the piece that is cut across, observe the soft spongy marrow in the interior of the bone. What is its color in a freshly cut bone? Why? Note the thin, tough membrance, or periosteum, which covers the bone.

2. Place a chicken bone or other small bone into muriatic or nitric acid for two or three days. After it is removed and washed, how does it compare with the bone before it was placed into the acid? Is it stiff and hard, or more flexible and softer? Why? These acids are strong poisons and must not be permitted to touch the skin, clothing, or anything else round about.

3. Put another piece of bone into a hot fire for a few hours. After it has cooled, examine it to see how it differs from the bone before it was burned. What has caused the change?

4. Examine samples of splints used in the treatment of broken bones. How do you account for the great variety of sizes and shapes?

5. Study an X-ray picture of a bone. Describe what you see.

Health Problems and Questions For Discussion

1. Why are the bones frequently called the framework of the body?

2. Name two other uses of the bones?

3. What are joints?

4. Point out and make a list of all the different kinds of joints you can find in your body. Consider how well the motion allowed by these joints is just the right kind to enable you to do so many different kinds of things. Why is it necessary that joints should be kept moist at all times? How is this done?

5. Why will a fall or jar that will break a bone in an older person be less likely to do so in a younger one?

6. What does it mean to "set" a broken bone?

7. Why is it so important to have a doctor "set" a broken bone?

8. What is the value of the X-ray in the treatment of broken bones?

9. Name several foods that contain a supply of the lime that growing bones need to make them hard and strong.

10. Describe some deformities due to incorrect growth of bones.

11. Why is it even more necessary to hold the bones in correct standing and sitting positions in youth than in later life?

CHAPTER V

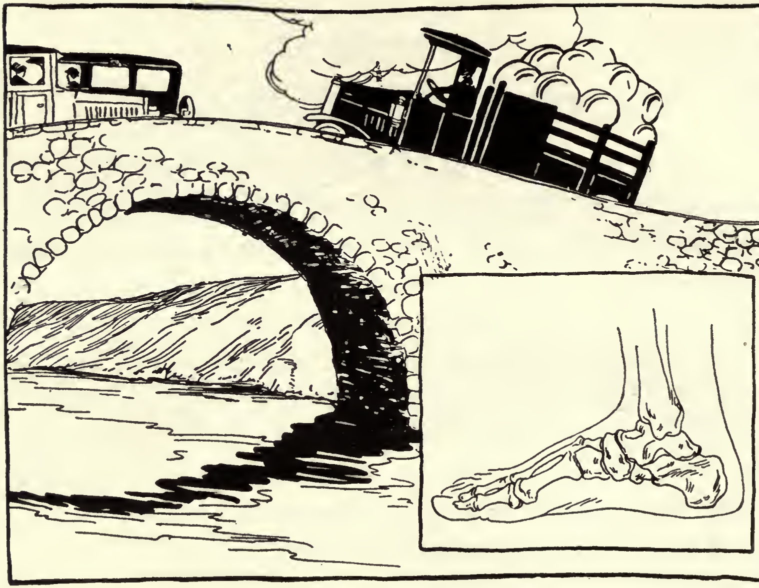
THE FEET AND THEIR CARE

The feet have very hard work to do. They support the weight of the body and help to absorb many of the shocks that come from walking, running, and other similar bodily movements. Success in many games, sports, and kinds of employment depends in great measure upon an active, springy condition of the feet. With reasonable care, the feet will go on performing their duties without causing pain or discomfort, but like many other parts of the body they will suffer and rebel from carelessness and abuse.

The Arch of the Foot:

The numerous little bones (26 in all) which make up the foot are arranged and bound together in the form of an arch. Constructed in this way, the greatest strength is obtained from the smallest and lightest amount of materials. The advantage of the arch in supporting weight is shown by the frequency with which stone, wooden, or concrete arches are used in the building of bridges, buildings, and many other kinds of construction.

The bones forming the arch of the foot are bound firmly together with tough ligaments and are attached to the muscles of the ankle by strong tendons.



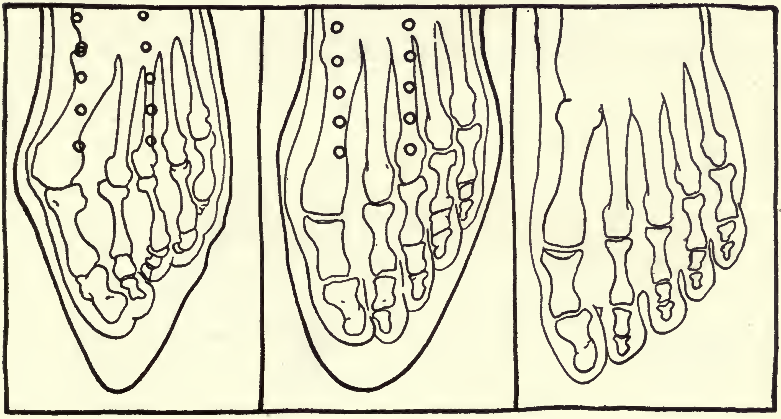
The arch is often used to support great weight in bridges and buildings. Look for examples of arches which are used for support.

The arch of the foot. A graceful, springy step depends upon the condition of this arch.

The soft, spongy cartilage between the different bones serves as a kind of cushion which helps to absorb the shocks and jars which are produced when the foot strikes the ground in walking, running, and jumping.

Importance of Properly Fitted Shoes in Preserving the Arch of the Foot:

Properly fitted shoes will give a helpful amount of support to the arch of the foot just where it is needed. Properly fitted shoes also preserve the shape of the foot. So long as the foot is not forced out of its



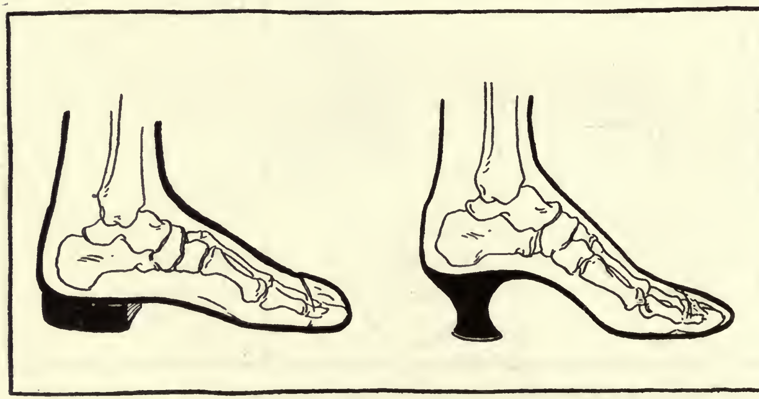
The above drawings are made from X-Ray pictures of a bare foot with all the bones in their natural shape and position; a foot in a properly shaped shoe; and a foot in an improperly shaped shoe. Can you label these drawings correctly?

natural shape the arch will do the work for which it is intended in the support of the bodily weight. Where improperly fitted shoes force the feet into incorrect shapes, the weight of the body is thrown upon some of the muscles in the foot and leg which are not

able to stand the strain of this extra work for long periods of time. Painful and serious foot disorders are the result.

Requirements of a Properly Fitted Shoe:

(1) *The shoe should be neither too large nor too small.* Test this by standing on one foot



A properly shaped shoe preserves the arch of the foot.

A high heeled shoe forces the arch of the foot into improper positions and helps to break it down.

and feel or have some one feel the foot inside the shoe. The shoe should not be so loose that the foot can move about in it freely nor should it be so small that the leather shows signs of

being tightly stretched across the top of the shoe. Do not depend upon the wearing of the shoe to stretch it until it becomes comfortable. The damage to the foot may be done by that time.

(2) *The shoe should be long enough so that the toes do not press against the front end of it.* Be sure to test this with all the weight upon one foot. Also test each shoe separately. Slight differences sometimes occur in the size of the feet or even in the shoes themselves, so that one shoe may fit just right and the other may be a little too tight or too loose.

(3) *The shoe should be broad enough* so that the foot rests flat upon the sole when all the weight is on one foot.

(4) *The heels should be broad and low.* High heels throw the foot too far into the toe of the shoe and cause changes in the shape of the foot.

No one type of shoe will fit all feet. The important thing is to find the type that best fits your feet. A little effort on your part in doing this will pay large dividends in comfort and service.

Walking and Running:

There are different ways of walking and running, some of which assist the feet in doing their work properly, while others are actually harmful.

In natural walking, the leg swings straight forward and the heel strikes the ground or the floor first. After the heel touches the ground, the weight of the body comes forward from the heel to the toe. Notice that as the toes leave the ground for the next step they give the body a push forward. It is well also not to let the heel strike the ground so hard that you feel the jar or shock. This will be transmitted or carried to other parts of the body and may cause injury to some of the more delicate organs.

In running, the toes or the sole of the foot should strike the ground first.

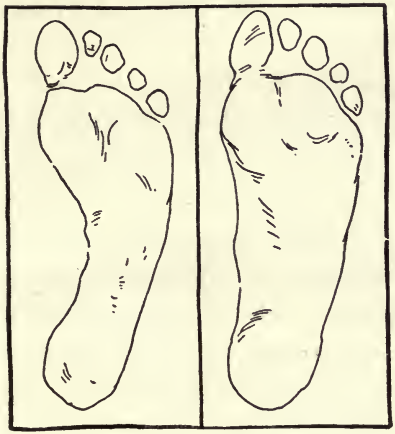
In both walking and running, it is most important that the toes point straight ahead. It would do less harm to the feet if they pointed slightly inward than to permit them to point outward to a considerable extent.

Flat Feet:

One of the most frequent and serious injuries to the feet is the breaking down of the arch of the foot, causing the condition known as flat feet. The most common causes are the wearing of improperly shaped shoes, wrong methods of walking, and poor nutrition.

High heeled shoes and narrow pointed shoes both force the bones of the foot out of their natural shape and throw the weight of the body on the muscles of the lower leg and the ankle. Excessive turning out

of the toes results in the same thing. The continued strain on these muscles causes the ankle to turn inwards. The inside of the arch of the foot then presses downward to assist in supporting the weight of the



Imprint of a normal foot. Note the hollow along the inner edge.

Imprint of a flat foot. The fallen arch is responsible for this unnatural condition of the foot.

body. As this occurs, the bones of the feet lose their elasticity and springiness and a heavy flat-footed gait or manner of walking results. Walking and standing then become very painful because of the continued strain on these muscles.

Poor nutrition weakens all the muscles of the body. This affects the muscles which hold the arch of the foot in place, and they gradually permit the arch to turn over and the condition of flat feet results.

Flat feet are found even among school children and can be discovered easily. The test consists in

wetting the soles of the bare feet and making an impression of the feet upon a dry surface. The differences between the normal arched foot and the flat foot are quite noticeable in the diagrams.

In the cure or relief of flat feet it is an excellent plan to consult an expert who has made a special study of the care of the feet.

Wear properly shaped shoes. Rest the feet as much as possible. Strengthen the muscles of the foot and ankle by massage and by such exercises as rising on the toes and so on. Give special attention to the diet in order that muscle strength and tone may be built up. Arch supports should be worn only when prescribed by an expert. Such supports often hinder the muscles from regaining their strength because they do the work the muscles should do in order to strengthen themselves.

Corns:

Corns are hardened, or callous, places which have formed in the outer layer of the skin. They cause pain by pressing down upon the sensitive nerve endings beneath. They are caused by the pressure of an improperly fitted shoe. Shoes that are so tight that they crowd the toes together, or shoes that are so loose that they allow rubbing are the most frequent causes. Consult an expert in their treatment and cure. It is best to prevent them by wearing properly fitted shoes.

Helpful Things to Do

1. Look at the shoes in a store window. Note the various shapes and styles. Are most of them designed in such a way that the foot will not be forced out of its natural shape? Are the heels high and narrow or are they broad and low?

2. Examine a number of pairs of shoes that have been worn for some time. Group them according to whether the soles are worn down evenly, or are worn more on the inside or more on the outside. What do these things tell about the feet of their wearers?

3. Wet the soles of the feet and press them upon a piece of dry blotting paper. Trace with a pencil around the edge of the impression and compare it with the diagram of a normal foot and with that of a flat foot.

Health Problems and Questions For Discussion

1. What is the arch of the foot? What are the advantages of an arch in supporting weight? Make a drawing of an arch.

2. How does a flat foot differ from the normal foot? What are some of the causes of flat feet?

3. How can flat feet be relieved or cured?

4. Describe the proper way to walk and to run.

5. What are corns? How are they caused? Why is it dangerous to cut or pare a corn with a knife?

6. Tell several things you could say to a boy or girl to prevent the purchase of shoes which have been made to follow a certain fashion and not to fit the shape and needs of the foot, and so to help them purchase the right kind of shoes.

The Playground and School Yard Apparatus make it easy to enjoy hours of out-door fun each day. It builds up strong muscles, too.

CHAPTER VI
THE MUSCLES

There is an old, familiar saying that "All work and no play makes Jack a dull boy." The happy games and sports of young people are usually full of motion and suit the vigorous lives at this age. The exercise that comes from them is just what is needed to help the muscles in their growth and development and to keep up the health of the whole body.

The Work of Muscles:

Our muscles serve us in a number of important ways, as follows:

(1) *Muscles produce all the movements of the body.* It would be hard to mention all the possible movements of the different parts of the body. Such a list would include nearly all that goes on while we are awake or asleep, at work and at play, at meals, at rest, and so on throughout our lives.

(2) *Muscles support the body.* In standing erect, the muscles hold the body up, keeping the different parts in their proper places and preventing the joints from bending at the wrong times. The head is balanced and held in place on the top of the spinal column by several sets of muscles.

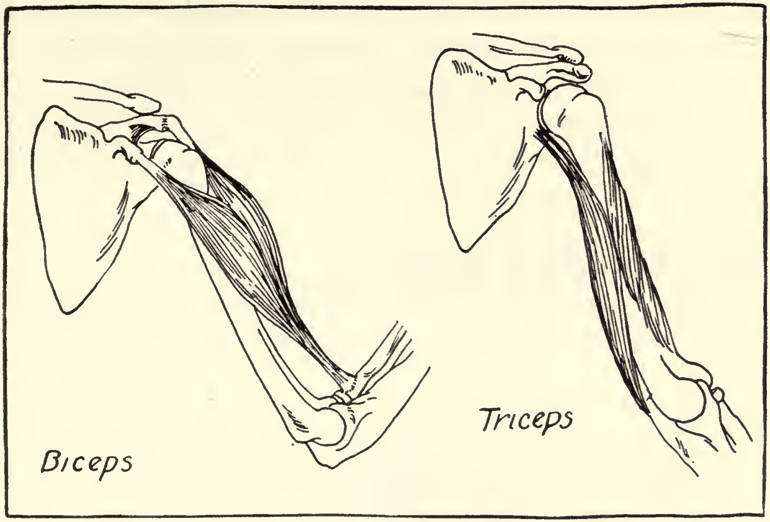
(3) *Muscles give protection to many parts of the body.* A number of large blood vessels pass along in their course deep down under thick layers of muscles and are thus protected from injury. Some of the strongest and thickest muscles of the body are located in the walls of the abdomen and give considerable protection to the important organs located there.

How Muscles Produce Motion:

Muscles are elastic and produce motion by contracting, or growing shorter. The ends of muscles are fastened to bones by strong non-elastic cords, or bands, called *tendons*. As muscles contract, they pull upon a movable part of the body with force enough to move it in the desired manner or direction.

This use of muscles is frequently illustrated by the work of the biceps muscle in the upper arm in raising the forearm. You can feel this muscle growing thicker as it contracts, by placing your hand upon it as the forearm is raised.

Note carefully that the forearm is lowered again by the contraction of another set of muscles located on the under side of the forearm opposite to the biceps muscle. Muscles can produce motion only by contracting or pulling. The arrangement of muscles in pairs holds true for all the five hundred and more muscles of the body, one set pulling in one direction, with a second set provided for motion in an opposite direction.



Biceps raising arm. Triceps lowering it.

Voluntary and Involuntary Muscles:

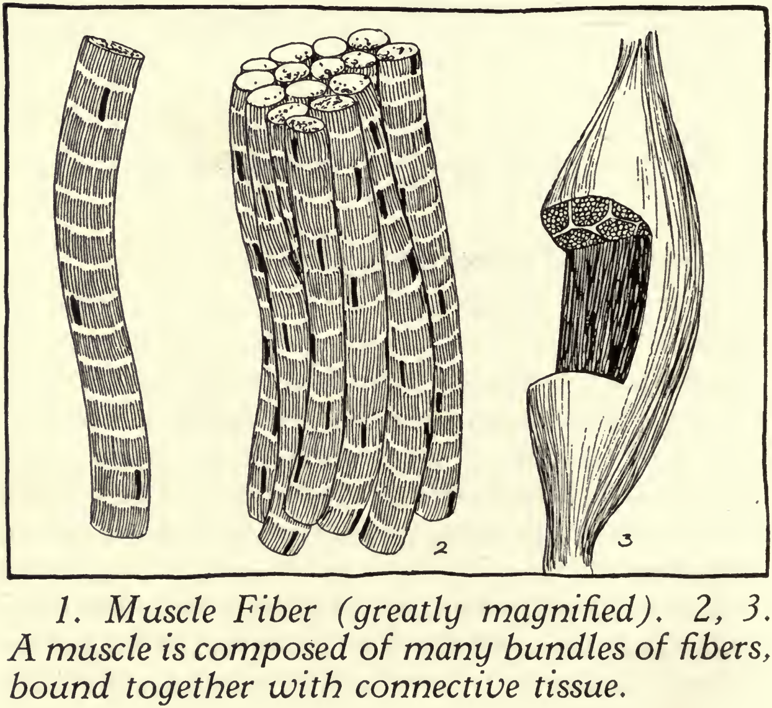
Most of the muscles of the body are subject to our control. They can be made to move or to remain motionless as we desire. If we wish to pick up a book from the floor we direct certain muscles to contract and do the work, or we can choose to let the book alone and give no orders to the muscles. The muscles which can be controlled by us are called the *voluntary* muscles.

There are some muscles, however, over which we have no control, and for this reason are called the *involuntary* muscles. Involuntary muscles control the

beating of the heart, the circulation of the blood, the processes of breathing, digestion, and some others. You can probably think of a number of reasons why these important processes should not depend upon our thought and control to keep them steadily at work day and night, year after year.

The Structure of Muscle:

Lean meat is the muscle of the animal from which it is taken. One of the best ways to study the struc-



1. Muscle Fiber (greatly magnified). 2, 3. A muscle is composed of many bundles of fibers, bound together with connective tissue.

ture of muscle is to examine a piece of lean meat after it has been thoroughly cooked. Using a needle, or other sharp pointed instrument, well-cooked meat can easily be separated into long thread-like strings called muscle fibers. Larger fibers can often be divided into still smaller ones and so on until each becomes very delicate and slender. Upon close examination each tiny fiber is found to be covered with a protective covering, or sheath.

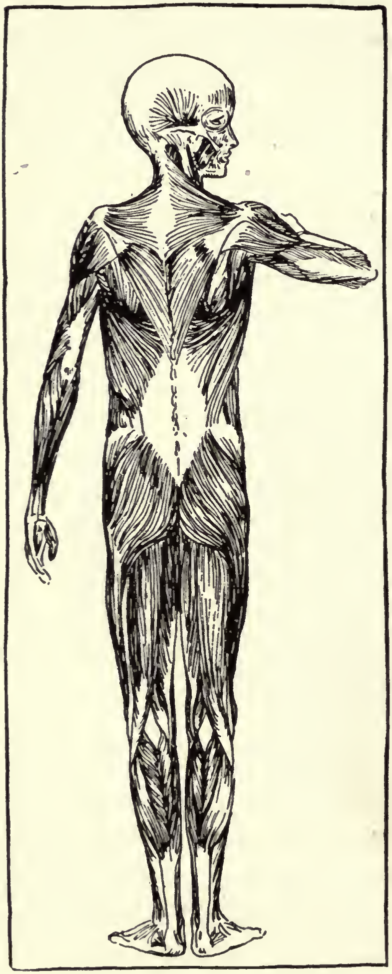
It becomes very apparent in examining muscle tissue that a single fiber can have very little strength by itself. In order to gain strength, therefore, a number of single fibers are fastened together in bundles and a number of bundles are bound together to make up a muscle. Additional strength is then obtained by the arrangement of several muscles in such a way that all can work and pull together as directed.

Bundles of muscle fibers are bound and held together by a substance called *connective tissue.* The reason that meat falls apart after being cooked for a long time is because the heat and moisture of the cooking break up this connective tissue.

GROWTH AND DEVELOPMENT OF MUSCLES

Like the bones, the muscles grow both in size and strength. A program which provides the best conditions for their growth and development must include a *regular supply of proper foods, abundant exercise,* and *adequate rest and sleep.*

Boys often take pride in showing off their "muscle" as they call it. What they really do is to contract the biceps muscle in the upper arm and to



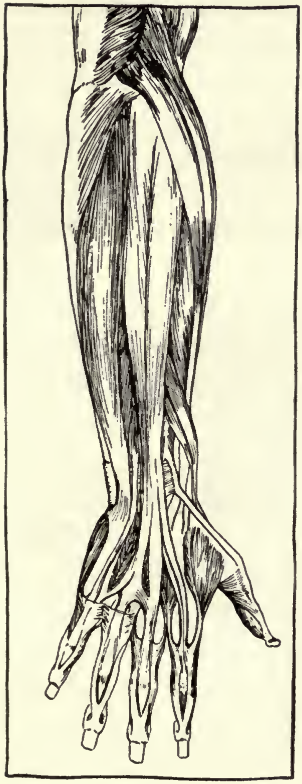
Muscles of the body as they would look if they were not covered by the skin.

Nearly half the weight of the body is made up of the muscles.

These muscles hold the frame work of the body in position and give it form.

There are some five hundred separate muscles in the human body.

make it as large as possible. Its firmness and size then become a measure of its growth and development.



Muscles and tendons that move the fingers.

The tendons attach the muscles to the bones.

By opening and closing the hand you can see the tendons working in the back of the hand.

Importance of Proper Food in the Growth and Development of Muscles:

The muscle tissue of the body needs food in order to grow and to repair its worn-out parts. Important

muscle-building foods are milk, bread, lean meat, peas, beans, and eggs. Milk especially is a valuable food for this purpose. Several glasses a day will go far towards supplying the needs of the muscles for strong and healthy growth and development. It is well not to eat meat more than once a day and in hot weather to reduce even this amount. Make up for it by more milk or other more easily digested foods.

Importance of Exercise in the Growth and Development of Muscles:

By *exercise* is meant the using of the muscles of the body. It can be obtained in numerous ways. There is exercise in many forms of work. Most games and athletics furnish it abundantly in its most attractive forms. Carefully planned "setting-up" exercises and drills provide helpful movements for many different sets of muscles.

Exercise makes the muscles grow and develop. It acts as a tonic for the whole body as well. Active muscles need an increased supply of food and oxygen. Breathing becomes deeper, and the heart beats faster in order to fill these needs. The increased blood supply carries off a larger amount of the waste materials of the body at the same time and adds this benefit to the general good that results from exercise.

Effects of the Lack of Exercise. Muscles become soft and weak when they are not used. They also become smaller in size. All of these effects are quite

noticeable after long periods of illness, when it is impossible to exercise as usual. After recovery has taken place and exercise is begun again, the muscles return to their former health and strength.

In order that some of the muscles of the body are not neglected in the matter of exercise, it is a good

Work as well as play is a tonic for the muscles.

plan to take part in a number of different kinds of plays, games, and sports.

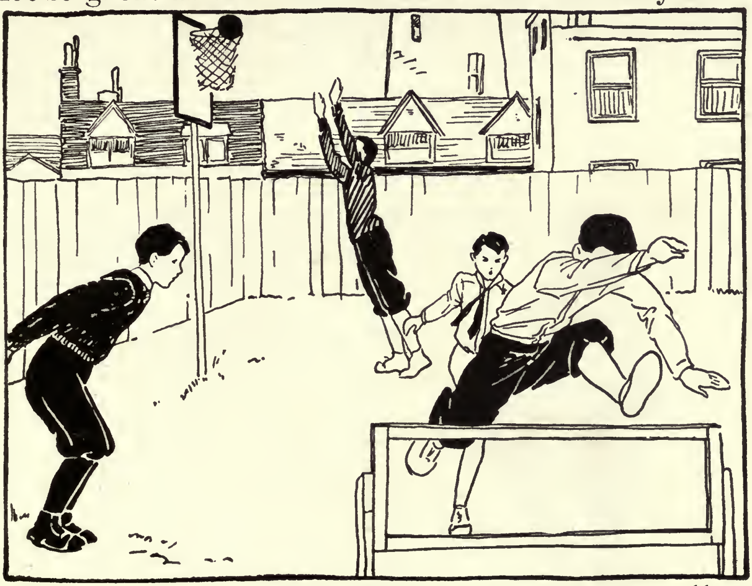
Work as a Form of Exercise. Many kinds of work give exercise to muscles. Employment, such as the running of errands, doing helpful things about the

How easy it is to follow this program in camp
Three Meals a Day and a Fine Appetite
Exercise—Sunshine—Fresh Air
Rest and Sleep

It is no wonder that our bodies thrive on camp life!

house, cleaning the yard and cellar, are among the most active kind.

Work in factories, offices, and mills gives exercise to the muscles, but in some cases the work is done under such poor conditions of light and ventilation, that the benefits which the muscles gain are not so great as the harm that comes to the body from



Games and track and field sports are excellent forms of exercise.

the poor working conditions. More and more employers, however, are now taking better care of the health of their workers than ever before.

Games and Athletics as Exercise. Games and athletics are among the best forms of exercise.

Most of them bring large numbers of muscles into action and train groups of muscles to work together. The frequency with which they are carried

This needs skill.

Will she do it?

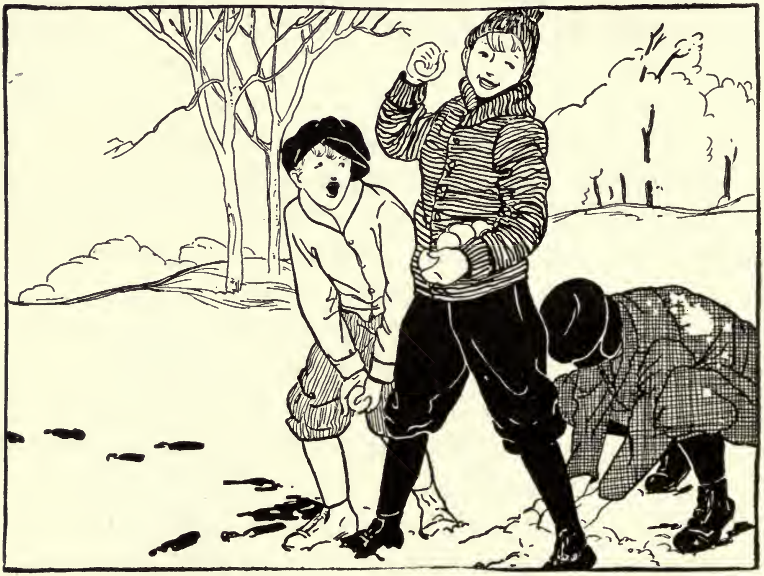
on out of doors is an added benefit, and then the pleasure and enjoyment they give is a splendid aid to health.

There are many good games to play, also track and field events that are fine for fun and exercise. How many of them do you know? It is not an easy thing to praise some of these more than others, for they are all valuable in promoting the health of the body. It might be pointed out that slow running is an especially valuable exercise for the whole body. Swimming, likewise, brings a great many different muscles into action and has an added advantage of usefulness in times of accident as well.

Setting-Up Exercises. Setting-up exercises and drills are bodily movements planned to exercise different sets of the muscles of the body. In a carefully prepared list of exercises such as that given on pages 396-406, all the important muscles of the body will have been exercised by the time they are all completed. These exercises are very valuable for people who do not have the opportunity for much active out-of-door work and play. Given between lessons in school they will provide relief and relaxation for the muscles and freshen up the thinking powers as well. Be sure to admit the largest possible amount of fresh air at the time they are taken.

Corrective Exercises. These are special body movements designed to improve or correct a faulty posture or other defect. Certain exercises will benefit stooped shoulders, others will strengthen weak ankles, and so. They should be planned by an expert to get the best results.

Good Exercise Habits to Form. Out of doors is the best place to exercise. There are very few days during the year when it is not possible and beneficial to play or exercise out of doors provided that the clothing is suited to the weather and proper care of



The weather adds to the fun

There are but few days during the year when it is not possible to exercise out-of-doors, if suitable clothing is provided.

the body is taken after the exercise is completed. When exercise has to be taken in doors, the windows should always be opened, but never exercise while sit-

ting or standing in a draft. Care should be taken to prevent the room from getting too cold. Always select a safe place for play whether it be out of doors or in doors.

Do not exercise hard immediately after eating. At this time the stomach needs all the extra blood it can get. Do not exercise when tired. Being tired is a warning that the muscles need rest to build up the parts which have been worn out.

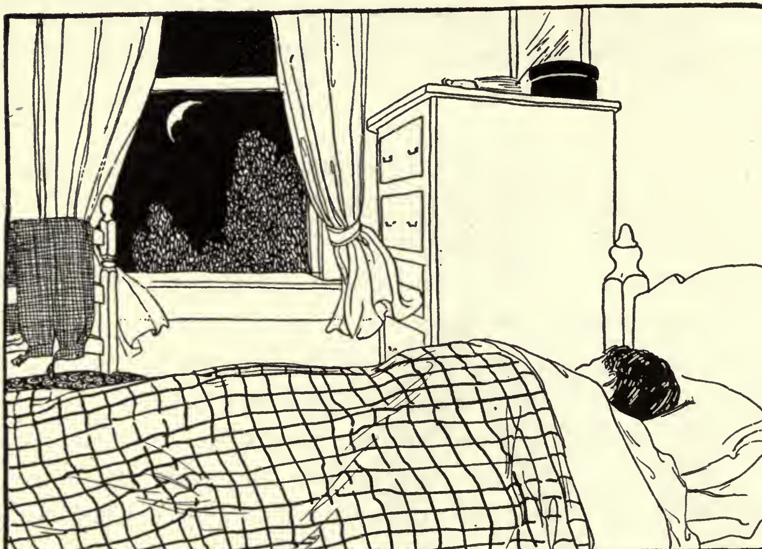
Some exercise out of doors every day is a good rule to follow.

Importance of Rest and Sleep in the Growth and Development of Muscles:

It is during rest and sleep that much of the worn out muscle tissue is repaired and replaced. Waste materials are removed and new muscle tissue is built up. The length of rest periods depends upon the amount and kind of the exercise. The longer and harder the play or the game the longer the rest periods should be. Even short rests, however, are better than none at all. Many games provide for rest periods in their rules by dividing the playing time into halves or quarters.

Sleep is the best form of rest. A good night's sleep is refreshing both to the body and the mind. In order that the greatest benefits be obtained from sleep, it is well to form habits of going to bed at a regular time each night and of sleeping long enough

to satisfy the needs of the body. The younger the person the more sleep the body needs. A very young baby sleeps most of the time. Children of school age up to about the age of twelve need at least ten hours



Do you know the "Fresh Air Fairies?" Let them in at night as well as day.

each night. From about twelve to fourteen years of age and up to the end of the growing period, about nine hours will usually be sufficient, while grown-ups should get an average of about eight hours a night. Keep the bed-room windows open wide while sleeping.

FATIGUE

Did you ever help to build a "shack," or "bunk," as the boys sometimes call it? One summer's day I watched a group of boys building one in the yard of a country home. They began early in the morning. Some of the boys dug the holes for the posts while others walked quite a distance down the road to an old, abandoned bridge and brought back the boards they needed. Trip after trip they made and hour after hour they worked. After awhile I noticed that some of the boys were walking a little more slowly than before and were not trying to carry so many boards at once. Were they losing interest in their bunk? Not at all, but they had worked so hard and so long that their muscles were calling out for a rest. The boys were beginning to feel the effects of *fatigue.* They were tired.

A few of the boys wiped the perspiration from their foreheads, took a drink of water, rested under a tree for a while, and then went to work again as enthusiastic as ever.

Causes of Fatigue:

As these boys worked, they used their muscles steadily. Whenever muscles contract, waste materials are formed right in the muscle tissue itself. The blood removes these wastes as fast as it can and carries them to the various places where they are eliminated from the body. In long continued muscular

action, however, the wastes are formed faster than the blood can remove them. They begin to collect in the muscles, clog them up, and interfere with their work. This and other effects cause the strength to grow less and less until the work or play can no longer be carried on as well as before. A rest at such a time permits the blood to remove these accumulated wastes, and gives the muscles a chance to repair their worn-out parts, and renew their supply of energy.

Worry is a frequent cause of fatigue. It does not take long to find out from experience that worrying about a thing prevents you from doing your best, either on the playground or in the classroom. The effects of continued worry are quite as harmful to the body as those from continued over exercise of the muscles.

In the course of the circulation of the blood about the body, some of the wastes that cause fatigue are carried to the brain. There they act as a kind of poison and cause the tired feeling that serves as the warning signal of fatigue. Rest and sleep usually remove these effects and leave the mind as clear and refreshed as before.

Overfatigue is Dangerous:

If some of the boys who built the "bunk" referred to in a preceding paragraph had worked day after day without taking enough rest, and possibly stayed up late at nights, and kept using up their physical

and nervous energy without allowing time for the tissues to build up their worn out parts, they would soon begin to suffer from the effects of *overfatigue.* The time would come when they would get up tired in the morning, fail to keep gaining in weight at the proper rate, and really become sick from the effects of the fatigue poisons that remained in the body.

On the other hand, vigorous exercise, once in a while, until a tired feeling results, is beneficial rather than harmful, provided always that the warning signals of fatigue are heeded in time and *the body feels refreshed after it is rested.* Such exercise speeds up the circulation of the blood, thus increasing the supply of oxygen and nourishment to the tissues and carrying the wastes promptly away. Remember that such exercise is beneficial and should be taken only so long as the recovery from the fatigue is rapid and complete. You should always feel refreshed after a rest or a good night's sleep.

Rest and Sleep Remove the Effects of Fatigue:

It is during rest and sleep that the blood has a chance to carry off the accumulated wastes and poisons of fatigue. The worn out parts of the tissues are repaired and built up and their energy is restored.

If you have ever been to a summer camp, you will remember that no matter how tired you were when you went to bed, you always woke up in the morning

refreshed and eager to do the same active and vigorous things all over again. The long hours of sleep in the fresh out-door air had cleared away all the effects of the previous day's fatigue. Therefore, the next best thing for us to do in our homes is to sleep long hours with the windows open wide, winter and summer. Provide extra bed clothing to keep warm in very cold weather rather than close the windows to keep out the cold.

Helpful Things to Do

1. Pick a piece of cooked lean meat apart. Note the fibers of which it is composed. Separate some of the connective tissue. How does this differ from the muscle tissue? What makes meat fall apart after being cooked a long time?

2. Make up a program for a boy to follow who wishes to increase the size and strength of his biceps muscle. Measure your running or ball-throwing or jumping ability against the standards of other boys your age. How should you proceed to bring them up to the standard, if necessary?

3. Make a list of games you can play. Which ones do you like best? Why?

4. Carry on an exercise like the deep knee bend until the muscle is tired. How does it indicate it is tired? Rest a short time. Exercise it again. Does it take as long to become tired this time? Repeat the rest and exercise for a few times more noting the length of time it takes to tire the muscle as the exercise is kept up. This would not be a good thing to do regularly. Why?

Health Problems and Questions For Discussion

1. Name three uses of muscles.

2. Make a list of a number of bodily movements. Which of these are made by voluntary muscles? By involuntary muscles?

3. How do muscles produce motion?

4. Can you explain why some meat is tougher than others after being cooked?

5. Name several muscle-building foods? Which one do you put first in your list? Why?

6. How does exercise cause muscles to grow larger and stronger?

7. Why is it better to exercise even a short time out of doors than a longer time in doors?

8. When is it harmful rather than helpful to exercise? Why is over-development of muscles quite as harmful as under-development?

9. Why are rest and sleep so necessary to the growth and development of muscles?

10. How many hours of sleep a night are necessary at your age? Do you get this number? More? Less?

11. What is meant by fatigue? How is it caused?

12. What is the warning signal of fatigue? What harmful results come from the continued neglect of this signal?

13. Why should rest or sleep follow vigorous work or play?

CHAPTER VII

TRAINING THE MUSCLES

Success or failure in many things depends as much or even more upon the control of the muscles as it does upon their strength and development. Muscles must be trained if we wish them to give us the best possible service with the least amount of direction and effort. The contrast between the slow and awkward movements of the beginner at the piano and the speed and grace of the experienced player is due chiefly to differences in the training of their muscles. In the first case, the muscles are called upon to perform movements that are new and strange to them, while in the other, they merely go through motions which have long since become familiar and easy.

How Muscles Are Trained:

Muscles are trained by use. As they go over and over the same movements they become accustomed to doing them in certain ways. The close attention and the careful direction that are needed in the beginning gradually become less necessary and important. Then, if the process of training is kept up long enough, the movements develop into habits and do their work in the same easy way each time.

The Development of Skill:

Most people like to do things well. Skill, or the ability to do things well, results from the careful

training of the muscles that are used. Watch a beginner at the typewriter, or at the piano, or pitching a ball. Note how hard the work appears and how little the results.

What would you make if you had his skill in using a Jack-knife?

Practice is the way to success in the development of skill. As practice continues, the muscles become used to their work. Many useless and needless movements gradually disappear. Speed and accuracy begin to increase, very slowly at first and then faster and faster until skill is reached. Hard work, perseverance, and patience are all needed in the development of skill, but the goal is well worth the effort.

Training and Skill Needed Alike in Work and Play: The skill needed in the proper handling of tools must be developed by practice. The muscles which

are used must be trained to perform their movements without needless loss of time and effort. Even so simple a thing as the driving of a nail with a hammer calls for a high degree of accuracy in directing the blows. Accuracy, like other forms of skill, comes only with practice.

"His third and last try." Skill as well as strength will count.

In playing games and sports, the necessity for practice is well understood. Players work long and hard in order to develop skill in their chosen sport. The runner practices a long time before the race to train his muscles to move quickly and easily in just the proper ways. The baseball pitcher must practice constantly throughout the season. The young athlete in the illustration on page 88 is measuring his ball throwing strength and skill against those of his companions. His success will depend as much upon how well he controls the direction of the ball as upon the distance it goes. Skill in controlling the direction of the ball will play a large part in the success of the winner who will then be repaid for the long hours of practice that have gone before.

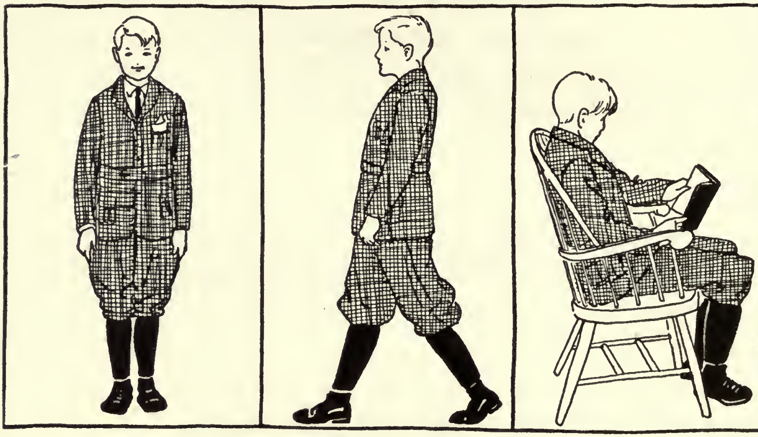
In team games, all of the players must practice until they are trained to work together and to help each other in their efforts to win. The skill of individual members of teams is frequently wasted unless the group is trained to play together.

Muscles Must Be Trained to Hold the Body in Correct Positions:

The West Point Cadets on page 38 are splendid illustrations of what can be done by the proper training of the muscles which support the weight of the body. It is easy for them to stand erect because their muscles have become accustomed to their duties and

are kept in the best possible condition to do the work for which they are intended.

Standing *Walking* *Sitting*



Good posture and good character are close friends.

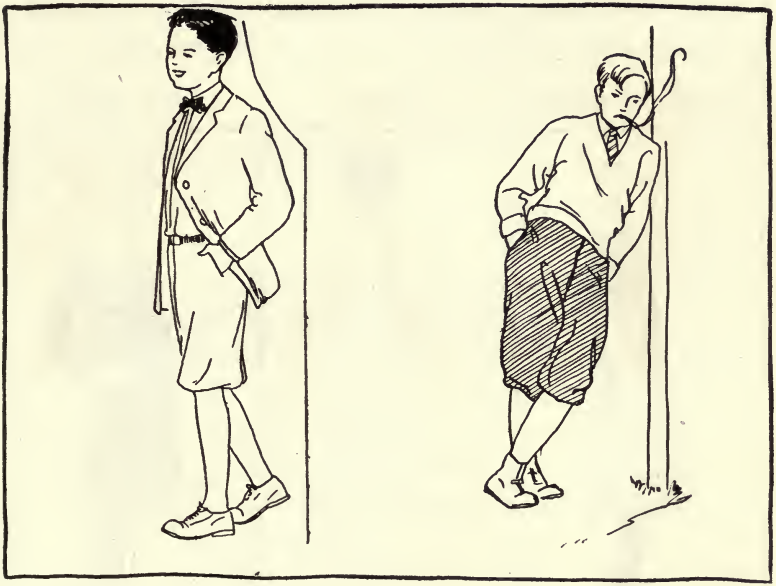
Walking: Strike the ground with the heel. Point the toes forward so that the weight of the body will be distributed evenly over the ball of the foot and the five toes.

Sitting: Sit firmly, with body erect. Sit well back in the seat. Rest the feet flat upon the floor.

How to Stand Erect:

(1) *Chest up, shoulders back, chin drawn in.*
(2) *Heels together, toes pointing forward.*
(3) *Arms at side.*
(4) *Stand as tall as you can.*

In order to hold the chest up and the shoulders back, the muscles of the back, the chest, and the shoulders must be strong and properly trained. In the beginning it will probably be necessary to think



Notice how often cigarette smoking and slouchy, careless posture go together.

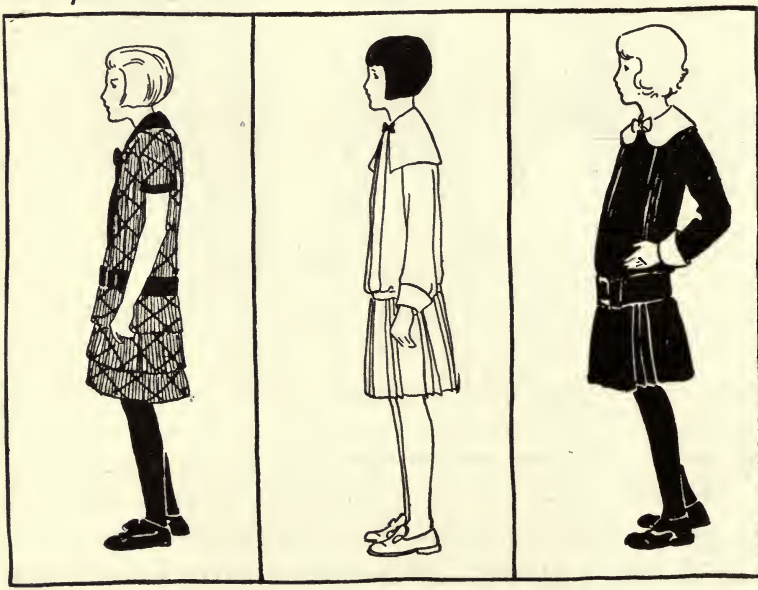
An erect, upright position inspires confidence and wins countless friends.

about the way you are standing from time to time and to straighten up whenever you find the shoulders falling forward. Before long, however, the muscles which hold the body erect will be so well developed and so used to doing their proper work that little

or no thought will have to be given to it. It has then become one of the important health habits we work so hard to form.

Compare the erect posture shown in the diagram shown on this page with the incorrect ones. Decide to model your own after the one in the middle.

Stooped Posture *Erect* *Slouched*



The stooped posture interferes with the proper development of the chest and lungs. In erect posture, the head, neck and trunk form one continuous, vertical line. In a slouched posture, the backbone or spinal column is forced into an unnatural position.

Proper Walking Position:

Walk, if possible, with the upper part of the body in the same position as when standing erect. The chest should be held up and the shoulders back. In any case do not slouch along as you walk. The toes should point straight forward and not turned too far outward.

Proper Sitting Position:

(1) *Sit firmly, with the body erect.*

(2) *Sit well back in the seat* so that the bones in the upper legs will support the weight of the body all along their length.

(3) *Rest the feet flat upon the floor* with toes pointed forward. Whenever you find yourself sliding down in the seat or bending too far forward, straighten up before the muscles get used to holding the body in these incorrect positions.

Posture Exercises:

All vigorous exercise will tend to improve posture. Have your physical training teacher recommend special exercises if you need them. Remember that good posture is worth working for.

Importance of Proper Posture:

All the parts of the body grow and work best when habits of correct posture are developed. Muscles

become stronger and firmer. The chest is held up and allows more air to enter the lungs. The blood finds it easier to circulate throughout the body. Notice in the incorrect position in the illustration on page 92, how the chest presses inward upon the heart and lungs, and interferes with their important work.

The posture of the body is often an indication of the character of a person. An erect, manly position inspires respect and confidence. It is a valuable aid to success in life.

Helpful Things to Do

1. Make a list of a number of things in games and sports which depend more on the training and skill of the muscles than on their actual strength, such as the throwing of goals in basket ball and the pitching of strikes in baseball. Which of these can you do well? What is the surest way of improving the skill in any of them?

2. Try to discover which muscles help to hold the body erect. Exercise these muscles a little each day and you will soon notice how it becomes easier to sit, stand, and walk in good posture.

3. Observe the standing and sitting positions of other people. Are they training their muscles correctly?

4. Ask an experienced typist or piano player to outline the program that was followed in the de-

velopment of the skill. In what ways are the methods alike?

Health Problems and Questions For Discussion

1. What is meant by the word "training"?

2. How are muscles trained?

3. What are some of the advantages of training the muscles to hold the body erect early in life?

4. What effects will the posture of an applicant for a position be likely to have upon the prospective employer?

5. Can you explain why teams practice so long before the first game of the season? Is practice still necessary for later games? Why?

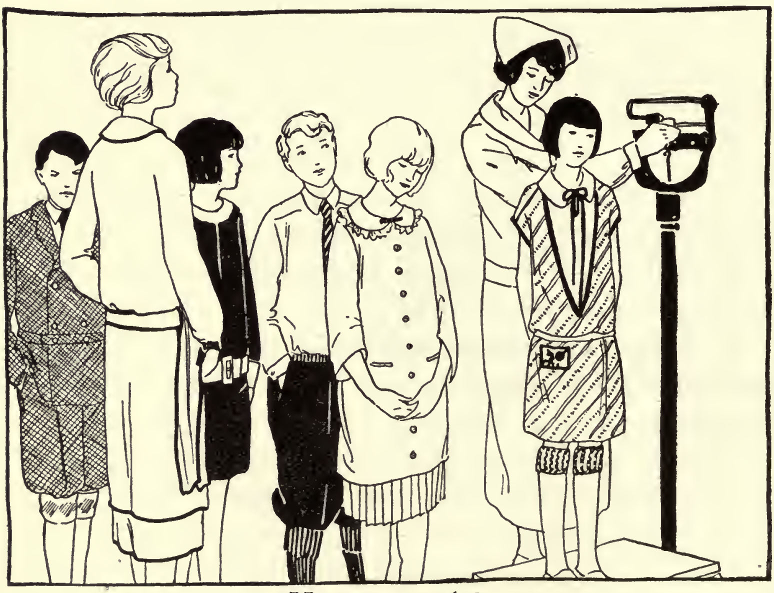
6. Did you ever train an animal to do tricks? Was patience necessary? Why?

7. After skill is once developed and practice is discontinued, it is easier to regain the skill than it was to gain it at first. Can you account for this?

CHAPTER VIII

HEIGHT AND WEIGHT

Do you weigh about what you should for a person of your height? Are you gaining in weight at a proper rate? These questions are being answered for the boys and girls shown in the picture on this page.



How much?

Scales for weighing and measuring are coming to be just as necessary a part of the equipment of a school building as the maps, desks, and the other things that have been used for so long.

Importance of Considering Height and Weight Together:

The height and weight have been found to give valuable information about one's growth and development whenever they are taken together and compared with each other. The weight alone is not so important, for at a certain age a boy or girl may weigh many pounds more than another at the same age and both may be gaining correctly. This is also true for height by itself, for at any particular age the tallest boy or girl may be several inches taller than another of the same age and still both may be growing correctly. Such individual differences in height and weight are largely due to the fact that people in certain families may all tend to be heavier or taller than the members of other families. Therefore, it must be remembered that the importance of records of height and weight comes from the relationship that exists between them and not from the separate values of either one.

Obtaining the Records:

Use the age to the nearest birthday. Measure the height in inches, standing in the stocking feet. Take the weight in pounds, with shoes removed, and wearing only the usual indoor clothing. Write down the results and then refer them to the "Measuring Scale" on pages 412 to 422. Be sure to use separate tables for boys and girls.

Keeping the Records:

Forms can be very easily ruled up on which the height and weight can be written down at different times. In this way a record can be kept for a number of months and the amount of gain compared with the following list of approximate normal monthly increases in weight:

Approximate Normal Monthly Increases in Weight

BOYS		GIRLS	
5 to 8 yrs....	6 ounces	5 to 8 yrs....	6 ounces
9 to 11 yrs....	8 ounces	9 to 11 yrs....	8 ounces
12 to 14 yrs....	12 ounces	12 to 14 yrs....	12 ounces
15 to 16 yrs....	16 ounces	15 to 16 yrs....	8 ounces
17 to 18 yrs....	8 ounces	17 to 18 yrs....	4 ounces

What the Records Mean:

Just when overweight or underweight becomes dangerous to the health depends upon a number of things, and is not agreed upon exactly by all experts. A safe rule to follow seems to be that if you are from seven to ten per cent or more underweight or about twenty per cent or more overweight you should consult a physician and try to discover the reasons for these differences and do all that is possible to reach a closer relationship between the height and the weight.

The figures for underweight in the Measuring Scale on pages 412 to 422 are calculated to show

when the weight is just ten per cent below the normal for any particular age, height, and physical type. Those for overweight show twenty per cent above the normal.

Overweight:

Overweight is often less serious than underweight. This is probably more true of children than of adults. Later in life, overweight is very likely to tax the body in a number of ways in its efforts to keep in health. Being too much overweight causes many inconveniences and should be reason enough for trying to reduce it. Unless caused by certain kinds of illness, it can generally be reduced by increased exercise and a more careful attention to the diet. The usual reducing diet calls for a reduction in the amount of starches and sugars, and the fats and oils. Bran or "Graham" bread is often substituted for white bread in such a diet. The table on pages 135-138 are helpful in this connection.

Underweight:

Being too much underweight is a serious bodily condition requiring careful attention and treatment. Persons who are from seven to ten per cent and more underweight are frequently found suffering from a condition often referred to as *malnutrition.* Investigations of the health of children in many parts of the

world have shown that this condition is so frequent that everything possible should be done to correct and prevent it.

MALNUTRITION

The word malnutrition is really made up of two words—*mal* meaning *bad* and *nutrition,* meaning *nourishment.* In such cases, therefore, something is interfering with the nourishment of the body. It affects both children and grown-ups, and is found among the rich and the poor alike.

How Malnutrition May Show Itself:

In growing persons, continued interference with the nourishment of the body begins to show itself by a failure of the weight to increase at a normal rate. See table on page 98. This, together with an actual loss in weight, causes it to fall so far below what it should be for the height that expert attention should be obtained to prevent more serious effects.

Persons suffering from malnutrition tire rather easily and cannot play as long or study as well as they could if their bodies were properly nourished. The muscles which help to hold the body erect are weakened and a stooped posture often results, with stooped shoulders and a flat chest adding to the harmful results of this defect.

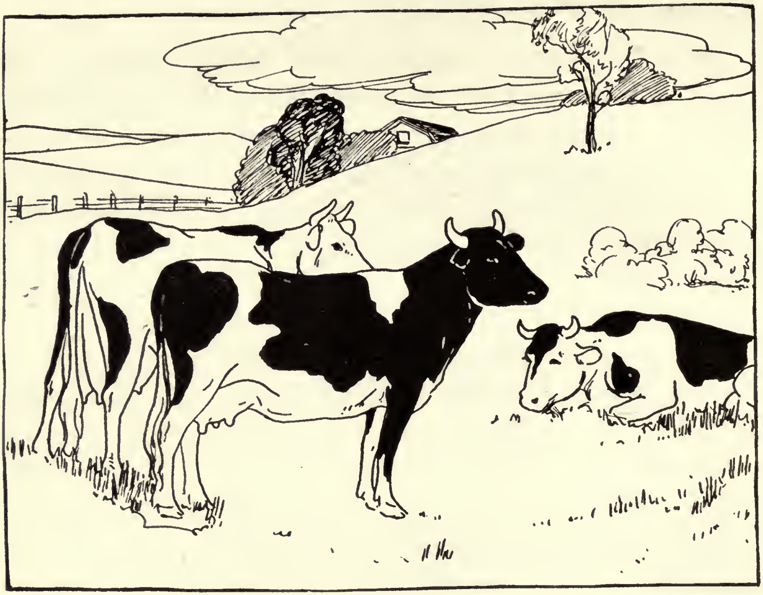
The resistance of the body is reduced, and diseases often get a start which might otherwise be prevented.

Causes of Malnutrition:

In a few cases, the improper nourishment of the body is the result of too little food. In a far greater number of cases, it has been found to be due to the presence of physical defects like diseased tonsils and adenoids and badly decayed teeth. The poisons that are poured into the blood stream from such diseased conditions prevent the body from making the fullest use of the nourishing foods that are eaten.

Other cases are traced to overfatigue, brought on by too much activity and too little rest and sleep. When this occurs day after day, the body is not able to repair its worn out tissues before new demands are made upon it for energy, and it keeps using up its reserve strength until the health is seriously impaired.

The wrong kinds of food are responsible for many cases. Rich and fancy foods are often prepared without much regard for the needs of the body. Candy and pastry between meals lessen the appetite for the regular meals. This forms a serious interference with the proper nourishment of the body. The time to eat candy and pastry, if at all, is directly after meals. Peculiar notions regarding foods often deprive the body of the benefits of some good, wholesome, nourishing foods. Children do not like this food or that food for reasons that could be easily overcome if they thought more of their value to the body.



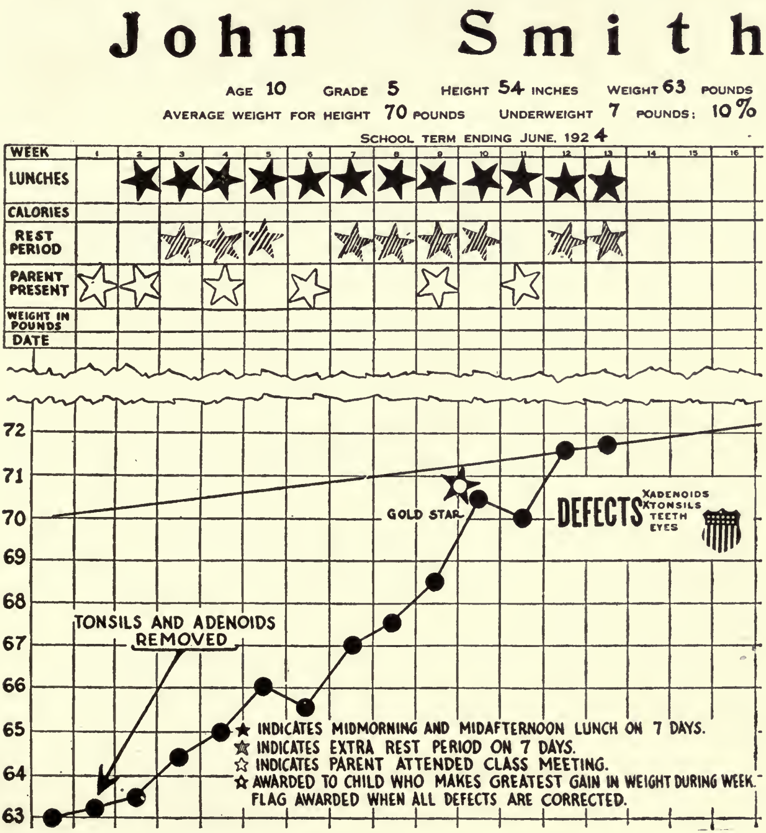
Milk is a splendid food. Drink lots of it.

Relieving and Correcting Malnutrition:

In correcting the condition of malnutrition it is important to find and remove the causes. A thorough medical examination by a physician will show whether there are physical defects needing correction or removal. Plan the meals more carefully and include a plentiful supply of wholesome, nourishing foods. Follow even more regularly than before all the various health habits and practices connected with *rest, sleep, exercise, cleanliness, elimina-*

tion of the waste materials of the body, and so on. Keep a weekly or monthly record of the weight, and strive for regular gains until the condition is safely removed.

In many schools, the pupils that are seriously underweight are organized into a group which meets frequently to receive instruction and to obtain and



compare their records of gains or losses in weight. The parents of the underweight children often attend such classes so that they may learn the ways in which they can help and encourage their children. The record of a pupil in one of these nutrition classes, as they may be termed, is shown on page 103. Note how regularly the gains in weight occurred after the diseased tonsils were removed, except for two weeks when the rest periods were not taken regularly.

Helpful Things to Do

1. Obtain your height and weight records. How do they compare with the standards for your present height and age? What per cent are you overweight or underweight? Is this more than it should be?

2. Plan a list of foods that should be used sparingly or not at all in order to reduce the weight. Plan a similar list of foods that help in correcting a condition of underweight. The list on page 138 will help in this work.

3. Plan and discuss a program for a class of underweight pupils. Why is the rest period so important in such a program?

4. Make posters and slogans which will direct attention to foods which will help to prevent underweight.

5. Make a chart upon which you can keep a record of your weight for a number of months.

Health Problems and Questions For Discussion

1. Why should the height and weight always be considered together in determining a condition of over or underweight?

2. What is meant by overweight? By underweight?

3. What per cent is often considered a danger line in underweight? In overweight?

4. What are some of the causes of underweight?

5. What are some of the dangers of being underweight?

6. What physical defects often help in causing underweight?

CHAPTER IX

FOODS

Food is one of the important necessities of life. All living things—plants, animals, and human beings alike—must have it in order to live and grow. Each form of life seeks the kind of food best suited to its needs, and secures it in its own particular way. Plants get their food from the soil through their roots. When their supply is used up they wither and die unless more is brought to them. Human beings and animals enjoy a great advantage over the plants in that when their food is used up in one place they can move on to seek it in another.

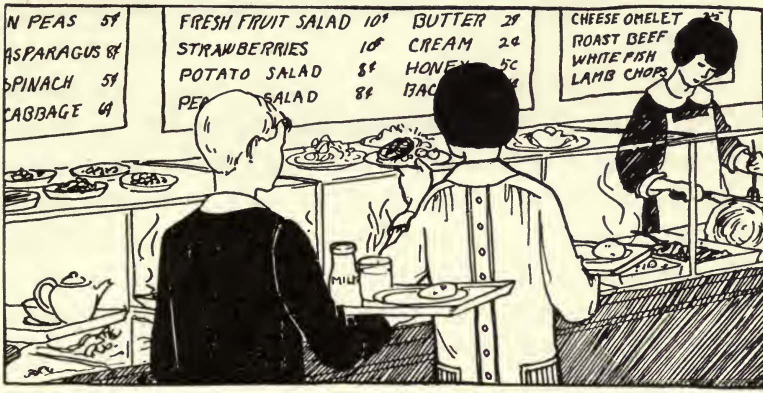
This search for food forms one of the chief purposes in life for most of the animals, and they are busily engaged in it from morning to night. Fortunately for us, our food habits can be arranged so that we can find time for many other important and pleasant duties as well. Our habits of cheerfulness and good fellowship at the table help to make mealtime much more than that of merely satisfying the need of our bodies for food.

The Wide Variety of Foods:

We use many different kinds and varieties of foods. They include the products of several food-producing occupations, and are brought to us from

all parts of the world. A list of all of them would be a long one.

A SCHOOL LUNCH CAFETERIA



The menu is well planned. Note that foods are included to supply all the needs of the body. Name the articles you would choose.

A convenient and helpful way to make such a list would be to group the foods which are alike in certain ways. Those that come from animals would be placed together to make a list of the meats. Others could be grouped as the cereals, vegetables, and fruits, while those which are used in a liquid form would be included under the beverages.

A grouping of foods in this manner shows in a striking way that the large majority of them belong to the plant or vegetable kingdom. The vegetables,

cereals, and fruits are all plants. Many beverages depend upon some part of a plant for their flavoring or food value.

The Importance of Plants in the Production of Foods:

Plants play an important part in the preparation of our food. It has been explained in an earlier chapter that our bodies are made up of a large number of tiny, living cells. Each of these cells is composed of elements called carbon, nitrogen, oxygen, lime, iron, phosphorus, and a few others. It is not difficult to see, therefore, that our food must contain these same materials in order that the cells may grow and develop.

These elements of which the cells are composed are found in the air, water, and the soil, but exist there in such a form that our bodies cannot use them directly for food. It is the work of plants to take them from the air, water, and the soil and change them into forms which can be used for the nourishment of the body. In the course of this change, the carbon, nitrogen, and the other elements first serve as food for the plants, gradually becoming a part of the substance of the plants themselves as they grow. Thus when we eat the various cereals, vegetables, and fruits we are supplying our bodies with just the proper materials for our own growth and development.

Meats pass through one additional change before they serve us for food. The plants in this case become the food for the animals, helping them to grow and develop. Then, after this growth has reached the proper point, the animals are killed and their flesh becomes our food. Milk is made in a somewhat similar way. The cows eat the grass, corn, or other plants for food. This food then serves the double purpose of providing nourishment for the growth and development of the animals and for supplying the elements that are needed in the manufacture of the milk.

The Use the Body Makes of Food:

The use the body makes of food is like the use of fuel in a furnace, or steam engine, in a number of ways. If you have ever learned to look after a stove, or furnace, or have watched others doing it you know how important it is to keep adding the right amount of the proper kind of fuel at regular times. In combination with the oxygen in the air this fuel burns up, giving off heat and leaving the waste materials which are formed. Then these ashes, or other wastes, must be removed as they accumulate to prevent clogging up the fire. Meanwhile, the whole process must be regulated by dampers or other devices so that the best results can be obtained at all times.

In order to meet its various needs, our body requires fuel. This is supplied in the form of the foods

we eat. Certain amounts of different kinds of foods must be provided at regular times.

In combination with the oxygen that is furnished by the air we breathe, this food is "burned up," supplying bodily heat and energy, and leaving waste materials behind. Just as in the case of the furnace, these wastes must be eliminated, or removed, from the body without delay. Then also the whole process must be regulated in order that the health of the body will be developed and kept up.

KINDS OF FOOD NEEDED BY THE BODY

The body needs food for three principal purposes, as follows:

(1) *For growth and repair of the tissues of the body.*

(2) *For the production of bodily heat and energy.*

(3) *For the regulation and protection of bodily activities and processes.*

Many foods can supply more than one of these needs and yet no one of them will satisfy all three for a long time by itself. Some foods provide most for growth and repair. Others supply large amounts of heat and energy, while some are chiefly valuable for their regulating and protective work.

Foods are often grouped or classified according to their principal use to the body in meeting these needs. The principal foods in each of these groups

are given in the remaining paragraphs of the chapter. The exact proportion of the different substances in each of these foods is given in the table on pages 135-137. Another way of showing the same proportions will be found on page 138.

Foods for Growth and Repair—the Proteins or "Body-Builders":

Unlike a steam engine, our bodies grow and also repair their own worn-out tissues. Foods for growth and repair must contain a substance called *protein.* For this reason the body-building foods are often called the *proteins.*

Protein is found in a number of different foods, some of which contain more than others. It is important to know the names of the protein foods and about how much they contain because it takes a much smaller amount of food rich in protein to supply the bodily needs than it does of food which has but a slight amount of this body-building substance in it. A number of the foods that are rich in protein are given in the following list:

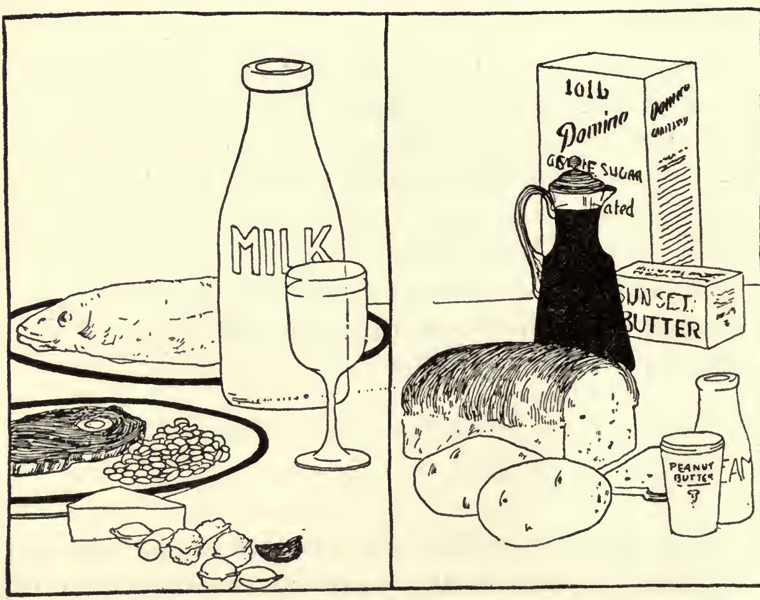
Lean Meat	Dried Peas and Beans	Eggs (The white is almost all protein)
Cheese	Nuts	
Fish		

Milk and the cereals also contain enough protein elements to include them among the body-building foods as well.

Some of the mineral salts that are needed for growth and repair are found in milk, cereals, vegetables, fruits, and water. Lime, iron, and phosphorus are among the most important of these mineral elements.

Foods Producing Heat and Energy—the "Fuel Foods":

These foods provide the largest part of the fuel the body needs for keeping up its heat and energy. They are the most numerous of all the foods, and include the starches and sugars, and the fats and oils.



"Body Builders" *"Fuel Foods"*

The starches and sugars together are often called the *carbohydrates.*

Starchy Foods	**Sugars**	**Foods Rich in Fats and Oils**
Cereals:	Sugar:	Fat Meats
Wheat (Bread)	Granulated	Lard
Corn	Pulverized	Eggs (yolk)
Rice	Maple	Butter
Oats	Corn Syrup	Nuts
Macaroni	Molasses	Cream
Potatoes	Ripe Fruits	Peanut Butter
Cornstarch	Honey	Olive Oil
Most Vegetables		Salad Oils
Fruits		

Milk contains a considerable amount of both the carbohydrates and fat and can hardly be classed as one more than the other and yet must not be neglected in considering the fuel foods.

The Regulating, or Protective, Foods:

These foods help to keep the important processes of the body in good working order. There are several kinds of regulating and protective foods, the most important of which are the following:

(1) *Bulky or Coarse Foods:* Foods of this kind have some coarse, bulky, indigestible parts which are not needed for nourishment. These bulky parts aid in the elimination of some of the waste materials of the body. They are found in foods like the following:

a. In vegetables like cabbage, spinach, lettuce, celery, onions, parsnips, turnips.

b. In fruits—apples, pears, prunes,

raisins, and others. Eating the skins of fruits whenever possible increases their regulating value.

c. In cereals from which the outside covering, or the bran, has not been removed, as bran and whole wheat bread, oatmeal.

(2) *Mineral Salts:* These are found chiefly in milk, cereals, fruits, vegetables, and water. The mild acids in fruits add to their regulating and protective values and place them among the most important foods for these purposes.

(3) *Water:* More water than that which is taken with the foods is needed to keep the body in good working order. Several extra glasses should be taken at convenient times throughout the day.

(4) *Vitamins:* Vitamins are substances, found in certain foods, which are necessary for the growth, development, and general health of the body. Several different kinds of these protective substances have been discovered, all of which must be provided in the diet. A few foods like milk, tomatoes, and the green, leafy vegetables contain all the vitamins that have so far been discovered. Other foods contain but one or two of them, while a few foods do not contain any at all.

How Vitamins Were Discovered:

The foods that contain the vitamins have largely been discovered by experimentation upon rats and other animals. Different animals have been fed day after day with certain foods, and the effects upon their growth have been observed. Some of the animals grew strong and healthy. Others failed to grow

EAT FRESH VEGETABLES

Vegetables supply vitamins and minerals for the growth of the body and iron for the blood.

very much and often developed certain diseases. Therefore the foods which kept the animals strong and healthy contained the necessary vitamins while some one or more of them were lacking in the others. In other cases it was found that where an animal failed to grow, or became sick, all that was necessary to start the growth again or to cure the disease was the addition to the diet of a food that contained the missing vitamins.

Experts in the study of foods are constantly conducting similar experiments and making their discoveries public from time to time. Such knowledge enables us to select the foods which will help us most in our growth and development and protect us against the ill effects and diseases which follow an improperly selected diet.

Vitamin-Containing Foods:

To make sure that our bodies get all the vitamins they need, it is best to include several different vitamin-containing foods in the diet. Such foods include milk and many of the products made from it, all the green leafy vegetables like spinach, cabbage, lettuce, other fresh vegetables, fruits and fruit juices, whole-grained cereals, eggs, and a number of others.

Helpful Things to Do

1. Make a list of the different foods you know, grouping them together as meats, vegetables, cereals,

fruits, and beverages. Which are more numerous, the vegetable or the animal foods?

2. Re-classify as many of the foods in the list suggested above as you can according to their principal use to the body, as "Body-Builders", "Fuel Foods", or "Regulating or Protective Foods". The list of foods given on page 138 will help in this classification.

3. Look after a stove or furnace for a short time. In what three ways does the use of food in the body permit of comparison with the burning up of the fuel in the stove?

4. Develop a little play in which the "Plants" present us with the different elements and food substances we need for our growth and development.

Health Problems and Questions For Discussion

1. What is the importance of plants in providing us with food?

2. What are the three principal needs of the body for food?

3. Name some of the most important "Body-Building" foods. Why are they called the "Body-Builders"?

4. What are the carbohydrates?

5. What bodily needs are supplied by foods rich in carbohydrates and fats and oils?

6. Name four kinds of regulating, or protective, foods. Mention some foods in each group.

7. What are vitamins? Name some of the most important vitamin-containing foods. Which of these do you include regularly in your diet?

CHAPTER X

CHOOSING OUR FOODS

The responsibility for the selection of our own food or for the feeding of a family is an important one. Its daily problems include the choosing of foods that will satisfy the needs of the body and please the taste as well.

The Body Needs Come First:

Hunger is the natural signal of the body for food just as thirst is for water. The needs of the body for food have been classified in the preceding chapter as follows:

(1) *Growth and repair of the bodily tissues.*

(2) *Production of heat and energy for bodily activities.*

(3) *Regulation and protection of bodily processes.*

The first thought in the selection of our foods should be given to the satisfying of these needs. Care and intelligence in this work lead to health and all the pleasures and joys that go with it, while carelessness and ignorance are often followed by their very opposites. Improper diet, it should be known, leads to a weakening of the physical and mental powers and abilities, reduces resistance to diseases, and lessens the chances of recovering from serious illnesses.

A Balanced Diet:

A balanced diet is one which provides enough of all the different kinds of foods required to satisfy the bodily needs. Too much of one kind of food for a long period of time is quite as harmful as too little. The balanced diet therefore takes into account the kinds of foods the body needs and the amounts of each of them as well.

Much more is known today about diet and nutrition than ever before. By means of experiment and observation, many kinds of foods have been analyzed and their value and importance in meeting the different requirements of the body have been determined. Some knowledge of these results is a great help in planning and selecting the foods for a balanced diet.

Many Things Help to Complicate the Problem:

There are a number of things that complicate the problem of selecting the right amounts of the proper foods for a balanced diet.

Some foods, for example, contain a large amount of protein, or body-building elements, others having little or none. Many are excellent fuel foods, while some are much less important for this purpose. A few are chiefly valuable for their coarse, indigestible parts which contribute to the regulation of the bodily processes rather than provide actual nourishment for the tissues. Some contain valuable mineral salts and

vitamins, while others are entirely lacking in these essential elements.

Then the amount of each of the different kinds of foods needed varies somewhat with the age of the person, the kind of work being done, and with the season of the year. Personal likes and dislikes toward certain foods sometimes enter and add to the difficulties of the problem.

The cost of foods is often an important consideration, as well. The substances which satisfy the bodily needs are found alike in both cheap and expensive foods. It is only necessary to know the proportions of the substances in these foods in order to make an intelligent choice which will suit all pocketbooks.

Protein, or "Body-Building" Foods, in the Diet:

As a general rule people are likely to eat too much rather than too little of this necessary food element. This is especially true if much meat is eaten. Other important protein foods are cheese, eggs, fish, and some of the vegetables. See lists on pages 132-137 and 138 for the amount of protein in many of our most common foods.

The waste materials that accumulate in the body when proteins are digested are often harder to get rid of than the wastes from other kinds of foods. An over-supply of body-building foods puts a great strain on the kidneys, which in the course of time may result in serious damage to these important

organs. Meat not more than once a day is a good rule to follow, and in hot weather even this amount should be reduced. Remember also that when meat is eaten, too much other food rich in protein should not be included in the same meal.

More protein in proportion to the weight is needed by young, active, growing persons than by those who have reached their full growth and lead less active lives. This does not mean that young people should eat more meat to get this extra supply. It is better to get it by adding larger amounts of well-cooked cereals, eggs, bread, and milk to the diet, all of which contain enough protein to meet this increased demand.

Fuel Foods in the Diet:

Fuel, or heat and energy producing, foods make up the largest part of all we eat. They include the foods rich in starch, the sugars, and the fats and oils. Some of them can furnish relatively large amounts of heat and energy while others are of much less value for this purpose. See pages 132 and 138 for a list of these values.

A larger amount of fuel food is needed by those who are active, or exercise vigorously, or do hard muscular work, than by those who lead more quiet and less active lives.

More fuel food is needed in cold weather than in

hot weather. This helps to keep up the bodily heat when the outside temperature is low.

Less fuel food is required in hot weather because less heat should be produced within the body when the outside temperature is high.

Starches and Sugars. The starches and sugars form the largest part of the food elements in the cereals and grains, vegetables, and fruits. In the process of digestion, the starch is changed into a form of sugar which is used by the body as the fuel in meeting its demands for heat and energy.

It is necessary today to caution against eating too much sugar. We take sugar into our bodies in a natural form in milk, ripe fruits, and in some vegetables. More is taken in the form of sweetening that is added to so many of our foods in their preparation for the table. Too much sugar, like too much protein, will cause serious harm to the body if the excess is continued for too long a time. It is wise, therefore, to eat sparingly of foods containing large amounts of sugar, such as candy, pastry, and cakes.

Fats and Oils as Fuel Foods. Fats and oils contain about twice as much heat value as the starches, sugars, and proteins. It is especially important not to use foods rich in fats and oils to excess in hot weather. This is also true when trying to reduce in weight.

In cold weather, the fats and oils serve to advantage in supplying the needed heat elements. It must

Fun, Fresh Air, and Fresh Vegetables
An Ideal Combination

be remembered, however, that fats and oils are harder to digest than the starches and sugars, and must not be used to excess. Fried foods should be avoided for this reason. Butter, cream, yolks of eggs, and nuts contain a form of fat and oil that is more easily digested and supply just as large a proportion of heat as other forms of fat more difficult to digest.

Storing of Fat in the Body. Persons occasionally eat more fuel foods than the body can use up at the time they are eaten. Our body is very thrifty and in order that these extra heat and energy elements may not be lost, it stores them up under the skin or around some of the organs of the body in the form of fat. At a later time when the needs for heat and energy happen to be greater than the immediate supply of these elements in the food, this storehouse is drawn upon to make up the difference.

Too much stored-up fat is a hindrance rather than a help. It is likely to cause actual harm to some of the organs of the body if permitted to accumulate to excess. The weight in proportion to the height as explained in Chapter VIII is a guide to this condition. Excessive over-weight should be avoided and steps taken to reduce, whenever necessary. A reduction in the fuel elements in the diet, together with an increase in the amount of exercise, usually succeeds in such cases without weakening or impairing the health of the body as a whole.

Regulating, or Protective, Foods Are Needed:

The body has a constant need of regulating, or protective, foods like the bulky foods, the mineral salts, water. and the vitamines.

"Regulative" Foods

Our daily diet should contain liberal portions of fresh green vegetables, also fresh fruits.

Eat at least two other vegetables besides potato every day.

Vegetables should form a regular part of the diet. Spinach, beets, celery, cabbage, lettuce, and many others provide the bulk that is needed in the digestive organs to stimulate them to regular action. In addition, they supply mineral salts and some of the valuable vitamines that the body must have to grow and keep strong and healthy.

Fruits and fruit juices contain vitamins and certain mild acids which are very beneficial in keeping the digestive processes in good working order.

Water and Other Beverages:

The body needs to be supplied with water even more regularly than with food. Persons can live for a number of weeks without food, provided they are supplied with water during this time. Deprive the body of both food and water, and death soon results.

Most of this water is needed to replace that which is lost in the process of eliminating the waste materials from the body, especially through the skin and kidneys. (Further discussion of the value and importance of water to the body will be found in the next chapter: "The Magic of Water.")

Cocoa and chocolate are beverages which have food values. As these values lie chiefly in the fats and oils they contain, they are better suited for use in winter than in summer.

Tea and coffee are beverages which are disturbing to the nervous system and should not be used at all by children. Their excessive use by adults often causes nervousness and other ailments. It is very unwise to begin drinking them at all, because such use soon becomes a habit which is quite hard to break.

MEASURING FOOD VALUES ACCURATELY

In order to tell accurately how much any food is worth to the body in producing heat and energy, a unit of measurement called the *Calory* (kal′-ō-ri) is used. A Calory is the amount of heat needed to raise one pound (about a pint) of water four degrees on the Fahrenheit thermometer, or one kilogram of water one degree on the Centigrade thermometer. The calory is merely a measure of an amount of heat just as the inch is a measure of length and the pint or quart is a measure of liquids.

As a result of many laboratory experiments, the amount of heat given off by the burning up of each kind of food has been determined. Further experiments have shown that food gives off about the same amount of heat whether it is used up in the body or burned up outside the body. Careful calculations are then made to determine just how many calories of heat and energy are required by our bodies under many different conditions.

Food Requirements in Terms of Calories:

As the needs of the body for food increase or decrease from time to time, the number of calories which must be supplied to meet these needs changes with them. In a general way, boys require a larger number of calories than girls, principally because of the more active and energetic lives of the former. The amount needed by both boys and girls has been

found to increase with age up to about the end of the growing period. Different kinds of work call for a larger or smaller number according to the differences in the muscular effort that enters into them. The harder and longer that the muscles are used the greater the amount of heat and energy that must be supplied. Then, the season of the year must be taken into account as well. More calories are needed in cold weather than in hot weather in order to keep up the heat of the body when the outside temperatures are low. A corresponding reduction should be made in hot weather so that too much bodily heat will not be produced.

Many experiments have shown that the average need for boys between the ages of ten and fifteen years may be placed at about 2500 calories a day, the younger boys requiring a little less than the average and the older ones a little more. This means that where 2000 calories will satisfy the body needs of boys of ten, as many as 3000 calories are needed for the same purposes by boys of fifteen. The average for girls may be placed at about 2000 calories a day, and just as with the boys, the needs of the younger girls will be satisfied by a little less than the average, while the older ones must have a little more. In this case about 1800 calories will do for girls of ten where 2200 calories a day will not be any too much for girls of fifteen.

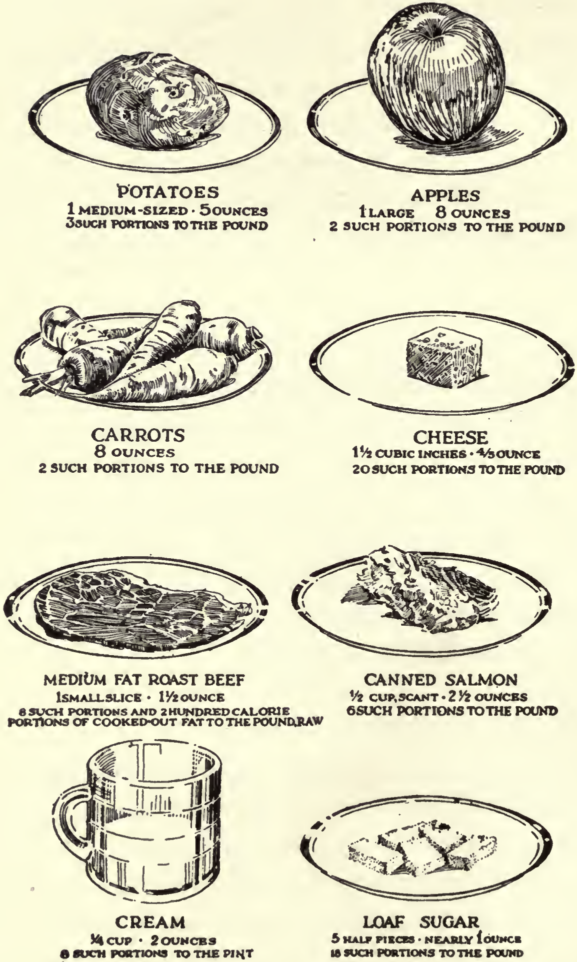
Similar experiments show that a man of ordinary

size, not doing any special muscular work or exercise, requires about 2500 to 3000 calories a day. Women, as a rule, need a little less than this amount, chiefly for the same reasons that girls need less than boys, on account of their less active lives. Doing hard, muscular work will raise this need to 4000 and even 5000 calories per day. Resting quietly in bed, on the other hand, requires but 1700 to 1800 calories a day.

By reference to the list of food values in terms of calories, it is possible to make selections which will supply any needed amount of heat and energy. In choosing articles of diet according to their calory values it is well to remember that in a balanced diet about ten to fifteen per cent should be proteins, twenty-five to thirty per cent selected from the fats, and the balance or sixty to sixty-five per cent be made up of the starches and sugars.

"100-Calory" Portions of Food:

It has been found that an ordinary helping or serving of many of our foods supplies about one hundred calories towards the daily total needed by the body. This has led to the use of the 100-calory portion as a convenient and reliable way of measuring food values. A number of illustrations from a chart published by Bureau of Home Economics, United States Department of Agriculture, are given on the following pages.



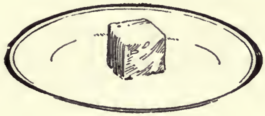
100-calory portions of a few familiar foods. (Bureau of Home Economics, U. S. Dept. of Agriculture.)

FLAKED OR PUFFED CEREAL
1¼ CUPS · 1 OUNCE
16 SUCH PORTIONS TO THE POUND

MILK
⅔ CUP · ⅓ PINT
6 SUCH PORTIONS TO THE QUART

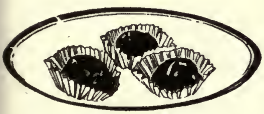
PRUNES
3 LARGE · 1½ OUNCES
11 SUCH PORTIONS TO THE POUND

BREAD
1 THICK SLICE · 1⅓ OUNCES
12 SUCH PORTIONS TO THE POUND



BUTTER
1 CUBIC INCH · NEARLY ½ OUNCE
34 SUCH PORTIONS TO THE POUND

PEAS
½ CUP 3½ OUNCES
2 SUCH PORTIONS TO THE POUND OF UNSHELLED PEAS

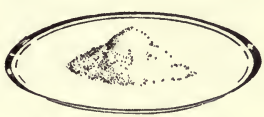


CANDY
3 SMALL PIECES · NEARLY 1 OUNCE
18 SUCH PORTIONS TO THE POUND

BOILED RICE
¾ CUP · 4 OUNCES
16 SUCH PORTIONS TO THE POUND, RAW

EGGS
1⅓ MEDIUM · 2½ OUNCES
9 SUCH PORTIONS TO THE DOZEN

TOMATOES
ONE POUND



GRANULATED SUGAR
1¾ LEVEL TABLESPOONS · NEARLY 1 OUNCE
18 SUCH PORTIONS TO THE POUND

COOKED BACON
2 SMALL SLICES · ¾ OUNCE
16 SUCH PORTIONS AND 9 HUNDRED CALORIE PORTIONS OF FRIED-OUT FAT TO THE POUND, RAW

100-calory portions of a few familiar foods in terms of ordinary household measurements and quantities commonly purchased. Estimates based on average food values. (Bureau of Home Economics, United States Department of Agriculture.)

TABLE OF 100-CALORY PORTIONS OF FOOD*

Name of Food	Size of 100-Calory Portion	Weight of Portion in Ounces	Distribution of the Calories		
			Protein	Carbo-hydrate	Fat
Cereals and Flour Products:					
Bread, white	Two slices, 3 in. x 3½ in. x ½ in.	1.3	14	80	6
Crackers, soda	Four crackers	0.9	10	70	20
Cornstarch pudding	One-fourth cup	2.7	9	67	24
Macaroni	One cup	5.2	15	83	2
Macaroni and cheese	One-half cup	2.1	17	44	39
Oatmeal, cooked	One cup	7.9	17	67	16
Rice, boiled	Three-quarters cup	4.0	9	90	1
Shredded wheat	One biscuit	0.9	13	82	5
Apple pie	Piece 1½ in. at edge	1.6	3	56	41
Dairy Products:					
Butter	One level teaspoonful	0.5	1	0	99
Cheese	Piece, 2 in. x 1 in. x ⅜ in.	0.9	25	3	72
Milk	Five-eighths cup	5.1	19	29	52
Ice cream	One-quarter cup	1.8	4	45	51

TABLE OF 100-CALORY PORTIONS OF FOOD*—Cont'd

Name of Food	Size of 100-Calory Portion	Weight of Portion in Ounces	Distribution of the Calories		
			Protein	Carbo-hydrate	Fat
Fruits:					
Apples, fresh	One large	7.5	3	92	5
Apple sauce	Three-eighths cup	3.5	1	96	3
Bananas	One large	5.5	5	89	6
Oranges	One large	9.5	7	91	2
Meats, Fish, Poultry, and Eggs:					
Beef, roast	Slice, 5 in. x 2½ in. x ¼ in.	1.6	46	0	54
Lamb chops	One chop, 2 in. x 2 in. x ½ in.	1.6	40	0	60
Chicken	Slice, 4 in. x 2¼ in. x ¼ in.	1.7	51	0	49
Eggs, raw	One and one-third eggs	2.7	36	0	64
Nuts:					
Almonds	Twelve to 15 nuts	0.5	13	11	76
Peanuts	Twenty to 24 single nuts	0.6	19	18	63
Soup:					
Tomato, canned	Three-fourths cup	7.0	12	76	12

TABLE OF 100-CALORY PORTIONS OF FOOD*—Cont'd

Name of Food	Size of 100-Calory Portion	Weight of Portion in Ounces	Distribution of the Calories		
			Protein	Carbo-hydrate	Fat
Salads:					
Chicken	One small serving	1.6	12	2	86
Mayonnaise Salad Dressing	One tablespoon	0.5	1	2	97
Vegetables:					
Asparagus	Twenty large stalks, 8 in. long	15.9	32	60	8
Baked beans	One-third cup	2.7	21	61	18
Cabbage, shredded	Five cups	11.2	20	71	9
Lettuce	Two large heads	18.5	25	61	14
Spinach	Two and one-half cups	21	12	80	8
Tomatoes, fresh	Two to three medium size	15.5	16	86	16

Adapted from M. S. Rose: "Feeding the Family."

PROPORTION OR PER CENT OF FOOD SUBSTANCES IN SOME OF THE MORE COMMON ARTICLES OF DIET*

Name of Food	Protein	Carbo-hydrate	Fat	Water	Mineral Matter
Cereals, Flour and Flour Products:					
Bread, white	9.2	53.1	1.3	35.3	1.1
Bread, whole wheat	9.7	49.7	.9	38.4	1.3
Cake, sponge	6.3	65.9	10.7	15.3	1.8
Crackers, soda	9.8	73.1	9.1	5.9	2.1
Flour, wheat	13.3	72.7	1.5	11.9	.6
Macaroni	13.4	74.1	.9	10.3	1.3
Oatmeal	16.1	67.5	7.2	7.3	1.9
Rice	8.0	79.0	.3	12.3	.4
Beverages:					
Chocolate	12.9	30.3	48.7	5.9	2.2
Cocoa	21.6	37.7	28.9	4.6	7.2
Dairy Products:					
Butter	1.0	0.0	85.0	11.0	3.0
Cheese, cream	25.9	2.4	33.7	34.2	3.8
Cream	2.5	4.5	18.5	74.0	.5
Milk	3.3	5.0	4.0	87.0	.7

PROPORTION OR PER CENT OF FOOD SUBSTANCES IN SOME OF THE MORE COMMON ARTICLES OF DIET*—Cont'd

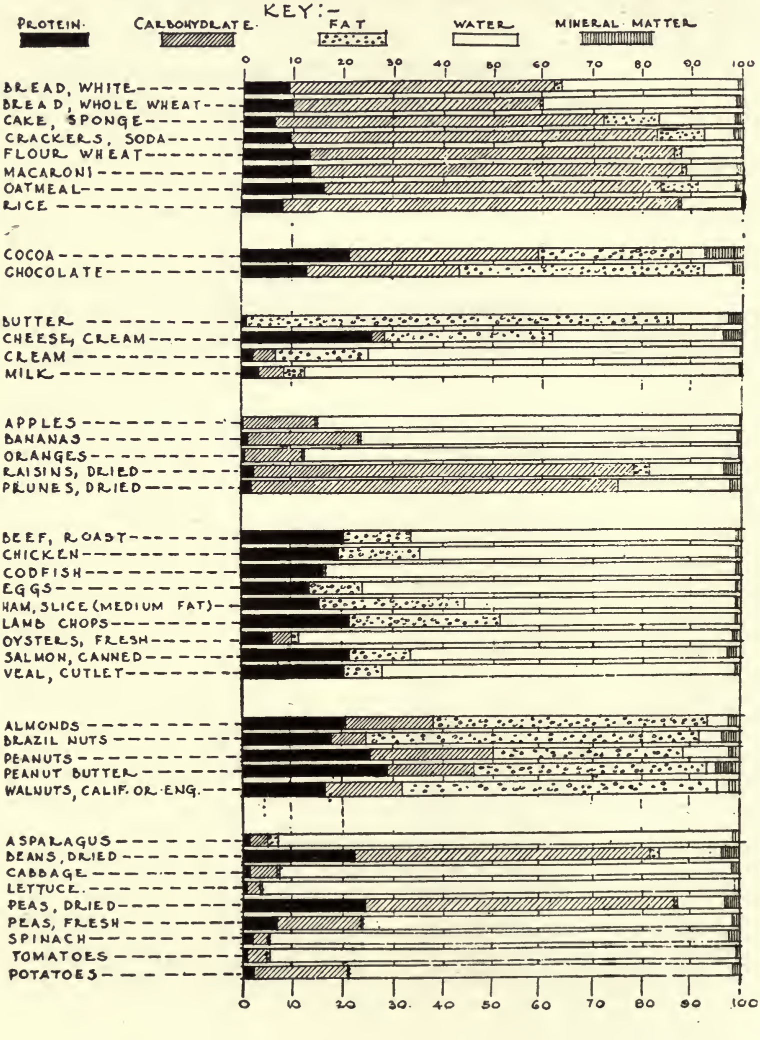
Name of Food	Protein	Carbo-hydrate	Fat	Water	Mineral Matter
Fruits:					
Apples	.4	14.2	.5	84.6	.3
Bananas	1.3	22.0	.6	75.3	.8
Oranges	.8	11.6	.2	86.9	.5
Raisins, dried	2.6	76.1	3.3	14.6	3.4
Prunes, dried	2.1	73.3	0.0	22.3	2.3
Meat, Fish, Poultry, and Eggs:					
Beef, roast	20.3	0.0	13.6	65.5	1.1
Chicken	19.3	0.0	16.3	63.7	1.0
Codfish, fresh	16.5	0.0	0.4	82.6	1.2
Eggs	13.4	0.0	10.5	73.7	1.0
Ham, medium fat	15.3	0.0	28.9	53.9	.8
Lamb chops	21.7	0.0	29.9	47.6	1.3
Oysters, fresh	6.2	3.7	1.2	86.9	2.0
Salmon, canned	21.8	0.0	12.1	63.5	2.6
Veal, cutlet	20.3	0.0	7.7	70.7	1.1

PROPORTION OR PER CENT OF FOOD SUBSTANCES IN SOME OF THE MORE COMMON ARTICLES OF DIET*—Cont'd

Name of Food	Protein	Carbohydrate	Fat	Water	Mineral Matter
Nuts:					
Almonds	21.0	17.3	54.9	4.8	2.0
Brazil nuts	17.0	7.0	66.8	5.3	3.9
Peanuts	25.8	24.4	38.6	9.2	2.0
Peanut butter	29.3	17.1	46.5	2.1	5.0
Walnuts, California	16.6	16.1	63.4	2.5	1.4
Vegetables:					
Asparagus	1.8	3.3	0.2	94.0	.7
Beans, dried	22.5	59.6	1.8	12.6	3.5
Cabbage	1.6	5.6	0.3	91.5	1.0
Lettuce	1.2	2.9	0.3	94.7	.9
Peas, dried	24.6	62.0	1.0	9.5	2.9
Peas, fresh	7.0	16.9	0.5	74.6	1.0
Spinach	2.1	3.2	0.3	92.3	2.1
Tomatoes	0.9	3.9	0.4	94.3	.5
Potatoes	2.2	18.4	0.1	78.3	1.0

*From Bulletin No. 28—U. S. Department of Agriculture.

Proportions or Per Cent of Food Substances Listed on Pages 132-137.



Common Sense in Securing a Balanced Diet:

In spite of all the care which could be taken in planning a diet, it is usually unnecessary to weigh the amount of the food we eat or to calculate the exact number of calories in each of our meals.

In most cases we need only to make sure that the proportions of proteins, fats, starches, and sugars are sufficient for the bodily needs and then to see that the weight remains about what it should for the height. In the case of growing persons, the gains in weight also should be regular and normal. It is when the weight begins to change or the regular gains in weight begin to vary from the normal that a more frequent reference to the table of calories should be made.

A SUGGESTED DAILY MENU

The suggestions of Dr. Lulu Hunt Peters, an experienced dietitian, are very helpful as a basis in planning a balanced diet. Her plan closely resembles that used in all building and construction. In such work it is customary, first of all, to build a solid foundation and framework out of strong, well-tested materials, upon which the remainder of the structure will rest secure. So, in the diet, there are a number of helpful, nourishing foods which should be chosen regularly to serve as a framework around which the meals should be planned.

These foundation foods, or "building-stones," which are to be distributed conveniently throughout each day's meals include the following:

At least one and a half pints to a quart of milk.

A big serving of cooked vegetables, especially greens.

A big, fresh salad.

Some fresh fruit, when obtainable; canned or dried fruit, when not.

Whole-grained foods, bread and cereals.

These will give the correct proportions of proteins, fats, starches, and sugars, and furnish the vitamines and mineral salts as well.

Add to this a plentiful supply of pure water and the balanced diet will be an easy and accomplished fact.*

Helpful Things to Do

1. Plan a sample menu to suit each of the following conditions:

a. A breakfast, lunch, and dinner for growing children, from ten to fourteen years of age.

b. A hot day in summer and a cold day in winter.

c. For a person who is overweight.

d. For a person who is underweight.

See pages 409-411.

2. Make a list of protein or body-building foods which may be used as substitutes for meat. How do these compare in price with meat?

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*"Diet for Children and Adults" by Lulu Hunt Peters, M.D., Dodd, Mead and Co.

3. Determine from the list of food elements on pages 132 and 135 why bread and milk are such wholesome and valuable foods.

4. Fresh vegetables are numerous and plentiful in some parts of the country only in summer. Make a list of the vegetables that can be obtained in winter in order that their regulating and protective values can be secured at this time.

5. Plan and draw posters to call attention to the necessity for drinking several extra glasses of water each day.

6. Calculate as closely as possible the total number of calories in a particular day's meals. How does the total compare with the average requirements? How is it proportioned according to proteins, carbohydrates, and fats?

Health Problems and Questions For Discussion

1. What are the three principal needs of the body for food?

2. What is meant by a "balanced diet"? How close does your own diet come to the conditions just given?

3. What is meant by a "Calory"? What is its value in connection with the study of foods?

4. Suppose you are not gaining steadily in weight or are under-weight; how could you tell accurately whether you were getting a balanced diet?

5. What conditions must be taken into account in planning the meals for a family?

6. Why do children need a larger amount of protein elements in their diet in proportion to their

weight than grown-ups? What foods will supply these without adding an extra amount of meat to the diet?

7. What is a serious danger of an over-supply of proteins in the diet?

8. What needs of the body are supplied by the starches and sugars? Why is it necessary to caution against eating too much candy?

9. Should the fats and oils be included more prominently in summer or winter diets? Why?

10. Why is it necessary to supply the body with several extra glasses of water each day?

11. What are the "Regulating, or Protective, Foods"?

12. What are some dangers of drinking impure water?

13. How can water be purified in the home?

14. What is the average daily number of calories needed by boys ten to fifteen years of age? By girls between these ages?

15. What is meant by a "100-Calory" portion of food?

16. What different kinds of foods are included by Dr. Peters in her suggestions for the daily menu?

THE MAGIC OF WATER

CHAPTER XI

Water, like food and air, must be classed among the great necessities of life. When water is obtainable, life manages to exist in places where food is scarce and the extremes of heat and cold are great. Without water, life cannot long exist even under the most favorable conditions of food and temperature.

The Magic of Water:

A knowledge of the value of water to plants helps us to understand the great dependence of human beings and animals upon it. Most of us have seen plants that have withered and died from lack of water. No amount of additional food without a supply of water will bring back the beautiful appearance of growing leaves and flowers.

The value of water is appreciated much more fully in regions where the rainfall is slight than in places where it is plentiful. Two adjoining fields in a dry region often present very different pictures to the eye. One will be parched and barren, with little or no vegetation of any kind. The other will be richly covered with the green of growing trees or plants. At a distance, the reason for the differences between the fields is not easily discovered. Coming closer, however, the little streams of water that are seen flowing along the irrigating ditches show in a very

striking way the great value and importance of water.

The Use the Body Makes of Water:

Water enters very largely into the composition of the body. From two-thirds to three-fourths of the weight of our body is due to the water it contains. The body cells have water in them. They are constantly bathed in the watery plasma of the blood which passes through the thin capillary walls into the tissues.

The blood is nine-tenths water. It forms a water transportation system for the body, taking oxygen and nourishment to the tissues and carrying off waste materials.

A watery fluid secreted at the joints makes possible the free and easy motion at these parts. The water in the muscle tissue plays an important part in giving elasticity to these hard-working parts of the body. There is water even in the bones.

Delicate membranes filled with a watery liquid surround and help to protect the heart, lungs, brain, and other important organs of the body.

Water is one of the important "Regulative," or "Protective," foods. It commonly contains lime and other needed mineral salts. The processes of digestion and the elimination of waste materials work best when the body is kept well supplied with

water. In its work of helping the body get rid of its waste materials, water can well be said to be quite as necessary for keeping up "internal cleanliness" as it is for "external cleanliness."

Loss of Water From the Body:

The amount of water in the body is not constant. There are many ways through which some of it is lost.

The largest losses occur in the processes of elimination of the body wastes. We have learned, probably to our surprise, that from three to four pints of water, or more, pass out through the pores of the skin each day as perspiration. An equal amount is lost daily through the wastes that are secreted by the kidneys. More is lost with the wastes from the intestines, and some is breathed out in vapor form in the expired air.

This total daily loss of water can readily be seen to amount to several quarts. It must be made up without delay, for the body does not store up water in reserve as it does nourishment.

Foods Supply Much Water to the Body:

A large part of the water the body needs is supplied by our foods. There is water in all foods, some of which contain very little, while others are nearly all water. Water is often added to foods in their cooking and preparation for the table and is taken into the body in this way.

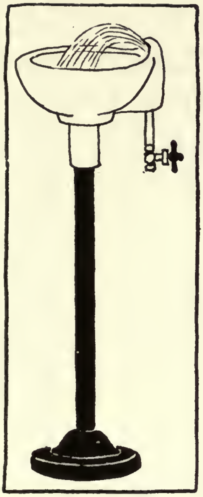
The lists on pages 132 to 138 show the proportion of water in many of our most common foods. It is interesting to note that meats are about half, or even more than half, water. Milk is nine-tenths water. Vegetables like tomatoes, lettuce, celery, and cabbage are nine-tenths water. Potatoes are three-fourths water. Apples and oranges are between eight-tenths and nine-tenths water. Even dried foods like peas, beans, flour, rice, and oatmeal are seen to contain some water.

Another important source of water for the body is the beverages, like milk, cocoa, and the much less desirable tea and coffee.

Additional Water Is Needed:

The water taken into the body with the foods is not enough to satisfy all its needs. It is well to form the habit of drinking from six to eight glasses of water each day to make sure that a plentiful supply will be provided.

Drink one glass before breakfast. The others can be distributed at convenient times throughout the day. Some can be taken between meals and the remainder with the meals. Water with meals is not considered harmful if it is taken between mouthfuls and not used to wash the food down. In this way it will not be so likely to weaken the saliva and interfere with its action upon the starchy parts of the food.



Drink Lots of Water

A Sanitary Drinking Fountain
A Safe Place to Drink

The practice of drinking ice water is dangerous. It checks the flow of the saliva in the mouth and the gastric juice in the stomach. This disturbs the process of digestion. It also checks the perspiration and interferes with the control of the bodily heat by the evaporation of this moisture which passes out through the pores of the skin. Cool water or even warm water will satisfy the sensation of thirst more quickly and effectively than ice water or very cold water. If ice water is taken, it should be sipped slowly. Drinking large quantities of ice water and drinking when the body is greatly overheated should be avoided because of their harmful results to the body.

Water Should Be Pure:

Pure water serves the body best. Intestinal disorders and epidemics of typhoid fever and cholera have frequently been traced to the use of water which has become polluted by sewage and other impurities.

Our water supply comes chiefly from the rain and the melting snows. The water in falling rain and snow is pure and safe to use for drinking purposes if impurities are kept out of it. It is important for us, therefore, to know what happens to the water from the time it falls as rain or snow until we take it into our body.

Keep Cisterns Clean:

In some places, rain water is collected in *cisterns* or other containers and used for all drinking and cooking purposes. Such containers should be cleaned out from time to time. They should be kept covered to keep dirt and other impurities from getting into them. Open rain barrels and cisterns are also favorite breeding places for mosquitoes. Much annoyance from these pests can be prevented by covering all receptacles in which water can collect.

Water From Springs and Wells:

The moisture from rain and melting snow disappears in several ways. Some evaporates and returns directly into the air in vapor form. The

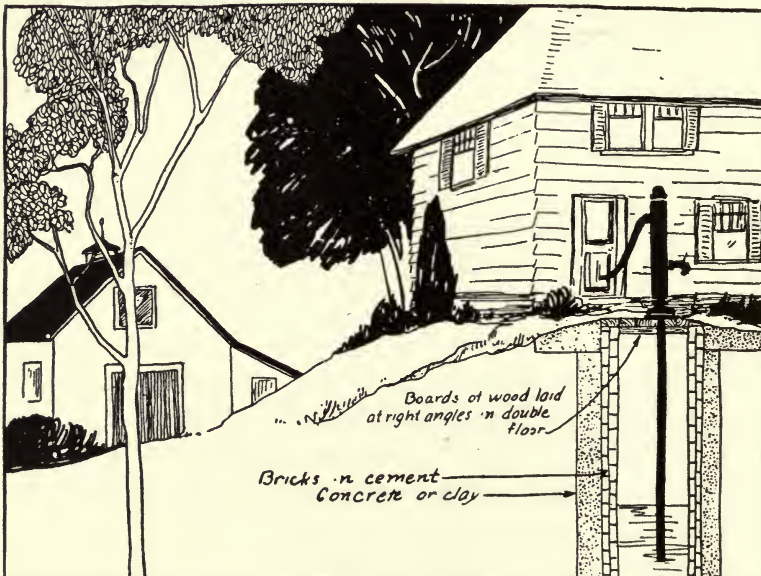
balance runs off into streams or other bodies of water or sinks into the ground.

If it disappears into the ground, it sinks until it comes to a layer of rock or clay through which it cannot pass. There it collects in pools or flows along in underground streams. Occasionally it finds an outlet in a hillside and forms a spring. Spring water is very likely to be pure and safe to drink unless impurities from houses or barns have found their way into it, or unless it contains too large amounts of mineral substances dissolved in it. It is always a good plan to question the purity of water from unfamiliar springs and streams until the possibility of impurities in them can be determined.

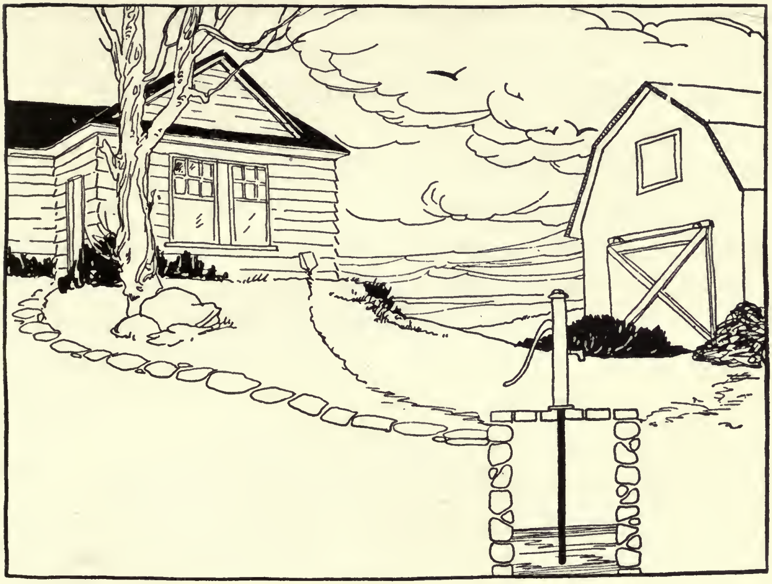
The usual method of obtaining this underground water is by digging or sinking a *well*. If the water is close to the surface, a shallow well is all that is necessary. The water will collect in it and can be pumped to the surface as needed. If the water is far below the surface, or if it is desired for other reasons, a hole is drilled deep into the ground. As the hole is made, a pipe is driven down. When the proper depth is reached, the water either forces itself up out of the pipe or is pumped out.

Especial care must be taken to prevent disease germs and other impurities from getting into wells. The location of a well is of great importance. It should be dug in a place where the drainage from house and barn cannot find a way into it. The

illustrations given on this and the opposite page tell their own story. You will note that the well on this page is so located and constructed as to prevent the possibility of contamination from the out-buildings or surface drainage, while the well on the opposite page is so located and constructed as to receive both waste and surface drainage. Persons drinking this impure water are pretty certain to become sick.



Our drinking water—is it pure? The well should be so located and constructed as to make pollution of drinking water impossible.



The drinking water from this well would be unsafe. Why?

Shallow wells should be lined with stone, brick, or other suitable material. The stone lining should be extended a little above the surface of the ground to prevent surface water from draining into the well. It should be completely covered to keep out dirt and other things that might fall into it and pollute it.

It is an excellent plan to have well water tested

occasionally in a chemical laboratory to determine its purity. Where there is any doubt as to its safety, it should be boiled before it is taken into the body.

Safe Water in Towns and Cities:

In cities and in many places of smaller size, the water is carried directly into the houses through a system of underground pipes. Cities are usually located along the shores of rivers. Other cities and towns spring up along its course. Great industries develop. The sewage from the cities and towns, and the wastes from the industries are often poured into the stream and make its water unfit to drink in its raw or natural state. Supplying pure, or safe, water in large quantities under such conditions becomes a serious and difficult problem.

Some cities spend large sums of money collecting and transporting water long distances from a source that is purer and safer than that found in the immediate vicinity. Other cities spend large amounts of money filtering and treating the water obtained nearby to make it safe to use. Water is filtered by passing it slowly through beds of sand, or other suitable substance. The sand removes the impurities, and the filtered water is collected in reservoirs and pumped through the water mains and pipes to the houses. If there is any doubt as to its purity after it is filtered, chloride of lime or other harmless chem-

icals are added to make sure that all disease germs are killed before the water is distributed.

When we consider the effort that is given and the money that is spent to make the water safe to use, it can be expected of us that we will do all we can to prevent its waste. There are also times when a little care and thoughtfulness on our part will prevent wastes from finding their way into a stream that very likely forms the water supply of some community along its banks.

Helpful Things To Do

1. Observe the effects of the lack of water on plants. What changes take place when a plentiful supply of water is given to a plant that is beginning to show the effects of the lack of water?

2. If you get water from a well, examine the well for places through which surface water might drain into it. Is it properly located to prevent drainage of wastes from the house and barn into it? Remember that the layers of soil under the ground do not necessarily slope in the same direction as the surface layer of the ground.

3. If your water is supplied from a city system, make inquiry regarding its source. Visit the Water Bureau, if possible. Report to the class the precautions that are taken to make it safe. Inspect the faucets to prevent waste from leaks.

4. Great areas in the Western part of the United States have been reclaimed for productive purposes by irrigation. Look up in a geography or other source how this is done and report it to the class.

Health Problems and Questions For Discussion

1. Name three of the great necessities of life.

2. What is the difference between dried fruits and fruits in their natural state?

3. What proportion of the body weight is due to water?

4. Describe several uses the body makes of water.

5. In what ways is water lost from the body?

6. Discuss foods as a source of water needed by the body.

7. How much water is needed daily in addition to that supplied by the foods?

8. People sometimes fast for weeks. During this time they eat no food, but they must be supplied regularly with water. Why is this necessary?

9. Why is it so important to drink pure water?

10. How can cistern water be kept pure?

11. What danger to the water supply comes from an improperly located well?

12. Describe two methods used by cities in obtaining a safe water supply for the people.

CHAPTER XII

COOKING

Cooking is the art of using heat in the preparation of foods for the nourishment of the body. It requires considerable knowledge and experience to do it well. There is so much to learn about it and so much practice is needed that it is taught in the high schools and colleges as well as in many of the grades in the elementary schools. Boys as well as girls are often instructed in it. Many boys' clubs and organizations require some practical knowledge of cooking in order to be promoted or advanced from one grade, or rank, to another.

Cooking has other important values besides the one that is usually thought of first of all—that of making our foods taste better.

Proper Cooking Is an Aid to Digestion:

Cooking prepares many of our foods for digestion. The heat and moisture of the cooking break up and soften the connective tissue of meats so that the digestive juices can get more easily at the nourishing parts. This is the reason that well-cooked meats often fall apart so easily. The fibres of vegetables become loosened and often separate from each other in the process. Starch grains in starchy foods are

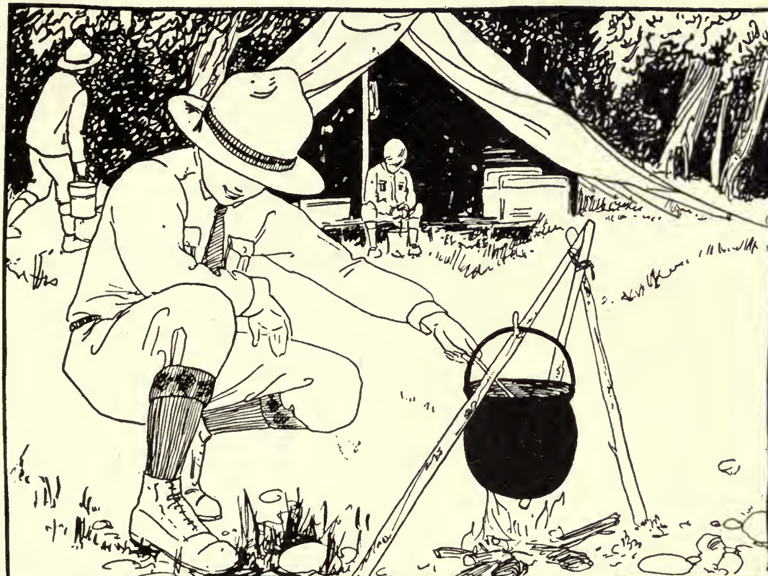
softened and made ready for their change into sugar in the course of their digestion.

Intelligent preparation and attractive serving add much to the enjoyment of our food.

Cooking Kills the Germs in Food:

Foods in their raw state often contain germs, or microbes. Most of these are of a harmless kind and cause no more damage than the spoiling of the food whenever the proper care is not taken to prevent it. Once in a while, however, disease germs find their way into foods. This usually happens as a result of some carelessness in their preparation or in handling

them afterwards. The surest way of removing all danger from such foods lies in cooking them thoroughly before they are eaten. Germs can withstand cold but are destroyed by heat. Some germs require a longer application of heat than others before they are killed, so it is well to continue the cook-



The Boy Scout is proud of his knowledge of cooking. Could you prepare a meal in camp?

ing long enough to prevent any from escaping. In a general way a half hour's cooking will make most foods safe from germs. Some of the meats, pork especially, are among those foods which require a

longer time to remove all dangers from this source.

Partial cooking to kill germs is sometimes used to keep certain foods from spoiling when ice or other cold storage places are not available. Meats, for example, that take several hours to cook thoroughly are sometimes cooked for an hour or so immediately after they are purchased. This partial cooking kills the germs which would cause the meat to spoil. Then, at a later time, when the meat is desired for the table, the cooking is completed.

Cooking Improves the Flavor of Foods:

Cooking improves the flavor of many foods and makes them more appetizing. Foods which we would not eat in the raw state are thoroughly enjoyed after being cooked. This greatly increases the number of different foods we can eat and adds to the variety of our diet.

Methods of Cooking:

The most common methods of cooking are boiling, baking or roasting, broiling, and frying. Many foods may be prepared in several of these ways. Potatoes, for example, may be boiled, baked, or fried. Meats may be prepared in a number of ways. It is by changing the methods of preparation that we can give a variety to our diet which keeps us from growing tired of some of the most common but valuable foods.

Of all the methods of cooking, frying is the least desirable. In the process of frying, the foods become soaked in the fat which is used. This makes them much harder to digest.

Some Foods Not Cooked:

Some foods need not be cooked before eating. This is especially true of a number of the fruits and vegetables. The important thing in such cases is to make sure that the foods are thoroughly washed and cleaned before eating.

Cleanliness in Cooking:

It is often said that the kitchen should be the cleanest room in the house. Certainly, the greatest care should be taken to keep foods clean during their preparation for the table. This will go far in preventing dirt and disease germs from getting into the body in this way.

Use of Seasonings in Food:

The use of seasonings like salt, pepper, and the other spices, vinegar, catsup, and oils make it possible to prepare foods to suit a wide variety of different tastes. Certain of them, like salt and the oil in salad dressings, have a food value, while others, like pepper and the spices, have practically none at all.

A little seasoning now and then that makes some foods more thoroughly enjoyed is a better stimulant to the digestive process than an actual dislike of the foods we eat. A danger in connection with their use is that we are very likely to keep increasing the amount as we become accustomed to them. Such excessive use of seasonings is often followed by irritation of the delicate linings of the digestive organs and a dulling of the appetite for any but the very highly seasoned foods.

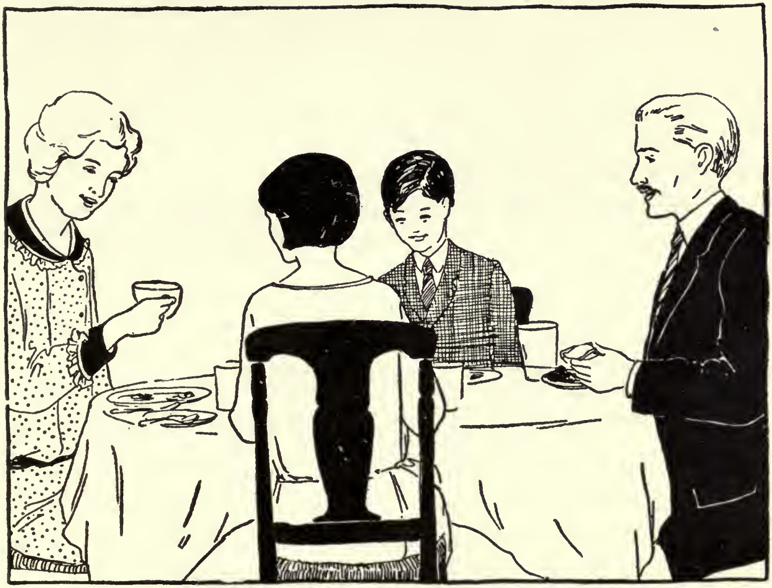
Cheerfulness and Courtesy at Mealtime:

Mealtime should be one of the most cheerful parts of the whole day. The table is not the place for the recital or discussion of the cares and troubles of the day. It has been clearly shown by experiment that the digestion is held back and interfered with by worry, nervousness, grief, fear, and similar expressions of our feelings that we may allow to become uppermost at such times.

Many opportunities offer themselves at the table to show courtesy and consideration to the other members of the family and to the guests who may be present. It is expected that you will offer to serve others before helping yourself and that you will always be ready to divide and share with others.

Allow time for at least a short rest after meals.

Vigorous work or play immediately after eating hinders the digestive organs in their important work.



Make cheerfulness and courtesy a habit at mealtime. They aid digestion.

Helpful Things to Do

1. Arrange a list of the foods you know which are always cooked before being eaten. Make another list of those usually eaten raw. Some foods like apples are eaten both raw and cooked. Can you think of others like them?

2. Compare meat before and after cooking to see the effect of the heat and moisture upon the

connective tissue. Do the same with vegetables. What differences do you find? In what ways are these changes an aid to the digestive process?

3. Organize a debate on the subject: "Cooking should be taught to boys as well as girls."

Health Problems and Questions For Discussion

1. An art is something that takes knowledge and skill to do well. Can you give several reasons why cooking is an art?

2. Tell what you know about each of the three values of cooking.

3. Name the different methods of cooking. What are some of the differences between them? Which of these methods is the least desirable for the health of the body? Why?

4. Name some foods that are often cooked in more than one way. Why is this an advantage?

5. Why is cleanliness in cooking so important?

6. What is meant by the use of "seasonings" in food? What cautions should be observed in their use?

7. Why is it important to be cheerful at mealtime?

8. Discuss the opportunities that mealtime offers in the development of courtesy.

CHAPTER XIII

DIGESTION

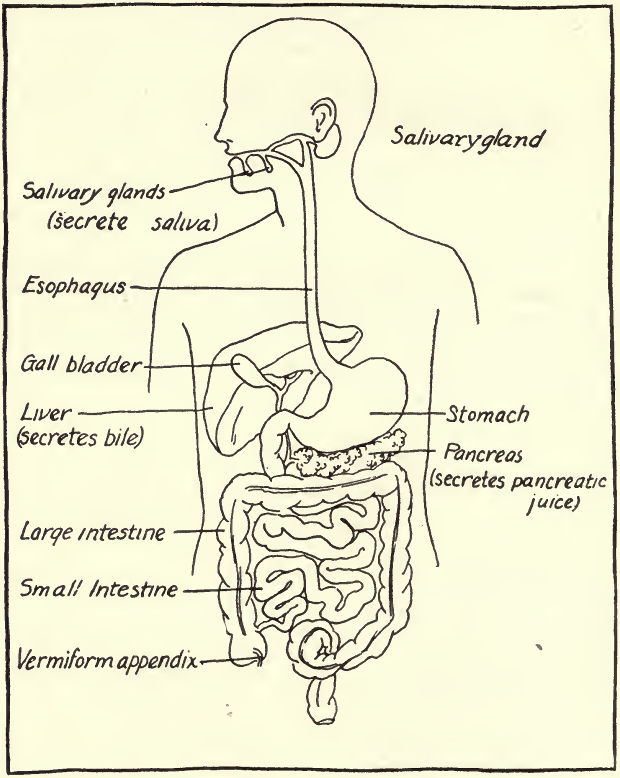
We have learned that a balanced diet supplies the body with food for growth and repair, heat and energy. The food cannot be used for these purposes, however, in the form in which it is eaten. Its protein, carbohydrates, and fats must first be "digested," or changed into forms which can be used by the body for its nourishment. These necessary changes take place during the process known as *digestion.*

FOODS ARE DIGESTED IN THE ALIMENTARY CANAL

The digestion of our foods takes place in the part of the body known as the *alimentary canal.* This canal is a continuous tube which begins at the mouth and changes its shape and size at different places in order to perform special parts of the process of digestion. The position and general arrangement of the different parts of this canal are shown in the diagram on the following page.

The alimentary canal is quite narrow as it leaves the mouth at the *throat, or esophagus,* but it soon spreads out to form the pouch, or bag-like portion

known as the *stomach*. Leaving the stomach it narrows again to form the *small intestine*. This lies



The Alimentary Canal is a Continuous Tube, especially designed for the Digestion and Absorption of Food.

coiled up in the abdomen in such a manner that a large amount may be supported in a comparatively

small area. From the small intestine the canal enlarges slightly into the *large intestine* through which the waste materials of digestion are sent out of the body.

Food is Mixed with the Digestive Juices in the Alimentary Canal:

The food is moved along the alimentary canal by the action of muscles which form a part of its walls. At certain places along its course—in the mouth, stomach, and small intestine—the food comes in contact with the *digestive juices,* as they are called. These digestive juices are watery liquids containing special substances, each of which has the power of changing a certain kind of food into the form in which it can be used by the body. They are secreted by *glands,* some of which are located within the walls of the alimentary canal itself, while others lead into it by ducts or tubes from the outside. These glands become quite active whenever food enters the alimentary canal, so that the digestive process can go on without delay. The particular work of each of the digestive juices will be described in later sections of this chapter.

What Happens to Food in the Mouth:

The food is chewed in the mouth. The teeth cut and grind the food into small particles. This is an important preparation for the processes of digestion.

At the same time the food is being chewed, it becomes thoroughly mixed with the *saliva*. The saliva is a digestive juice which is poured into the mouth from three pairs of salivary glands located there. The presence of food in the mouth greatly increases the amount secreted. Saliva contains a substance called "ptyalin" which begins at once to change the starchy parts of the foods into sugar. All starchy elements in food must be changed into a form of sugar before they can be used for the production of heat and energy. The saliva also softens and moistens the food so that it can be swallowed more easily.

Importance of Chewing Food Thoroughly

It is important to chew food thoroughly. The teeth are especially suited to their work and will cut and grind the food into fine particles if the chewing is continued long enough.

Birds have no teeth, but a special part of their alimentary canal is provided to hold grains of sand and bits of shell which act as the grinders for their food. We have teeth provided for this purpose and we give the whole digestive process a better start when we make the fullest possible use of them. Thorough chewing relieves other digestive organs of the necessity of breaking up the food as a preparation for its digestion.

The longer food is chewed, the more completely it becomes mixed with the saliva, and the greater the amount of the starchy elements that will be changed into sugar. The food will be more easily swallowed, as well.

It will not be found necessary to count the num-

It is so hard to wait. Two habits should help to hold him back:

(1) Chew food thoroughly.

(2) Rest quietly after meals.

ber of times food is chewed in order to obtain these results. Some foods will become thoroughly chewed in a comparatively short time while others will be found to require a much longer time. The important thing is to form the habit of chewing all foods thoroughly before swallowing.

How Food is Swallowed

The swallowing of food is controlled by the muscles of the *esophagus,* or tube which leads from the mouth to the stomach. It does not fall down this tube like things do when they are dropped to the floor, but it is pushed along by the muscles. After the swallowing is once started it is no longer under our control and cannot be stopped.

The action of the muscles in swallowing can be clearly observed in some animals. Watch a horse drink or swallow food. Note that the muscles of the esophagus actually push the water or food uphill in their passage into the stomach. Perhaps also you have seen acrobats drink while hanging head downwards. The action of the muscles is the same in both cases.

How Food is Kept Out of the Wind-Pipe

In addition to the entrance through which food passes into the esophagus, there is another opening in the back of the mouth especially provided for the air we breathe. This second opening leads into the wind-pipe, or air passage to the lungs. To keep the food out, the wind-pipe is provided with a little lid, or trap door, which automatically closes when we swallow. In its action it is somewhat like the lid of a box, raising and lowering as needed, although entirely outside our direction or control.

This little door closes promptly when we eat

slowly, chew our food thoroughly, and keep from becoming excited while swallowing. Once in a while, when we happen to be in too great a hurry, or are excited about something, small particles of food may get past the trap door into the wind-pipe. The violent coughing which occurs at such a time usually forces the particles out, but not until after we have had a very unpleasant and even a painful time.

Digestion in the Stomach:

The stomach is an enlargement of the alimentary canal, receiving the food passed into it from the esophagus. It acts as a kind of storehouse for the food that is swallowed and at the same time carries on an important part of the digestion of the protein parts of our food. Being unable to complete the entire process of digestion itself, it passes the food on a little at a time into the small intestine where further changes take place.

The digestion of the protein parts of food in the stomach is due to the action of the *gastric juice*. This digestive juice is poured into the stomach from tiny sacs or glands located in its walls. Its "active principles," or special substances, which do the actual work of digesting the proteins are known as pepsin, rennin, and hydrochloric acid. The acid nature of the gastric juice stops the work of changing starches into sugar during the time the food is in the stomach.

While in the stomach, the food is constantly moved

about by the contractions of the muscles in its walls, forward and backward, around and around, in a kind of churning motion. This makes sure that it becomes thoroughly mixed with the gastric juice. At the same time the water in the stomach softens and dissolves many parts of the food so that by the time it is ready to pass on into the small intestine it is a much thinner and more creamy liquid than when it entered the stomach.

The passage of food into and out of the stomach is regulated by the action of a little gate at each of its openings. At one end the gate prevents the food in the stomach from passing back into the esophagus, while the gate which guards the other opening regulates the passage of food into the small intestine.

Digestion in the Small Intestine:

The small intestine is one of the most important parts of the alimentary canal. The digestion of the starches which was started by the saliva in the mouth, and the digestion of the proteins which was begun by the gastric juice in the stomach, are continued and completed in the small intestine. In addition to these, the fats and oils which have remained unchanged up to this time are now digested.

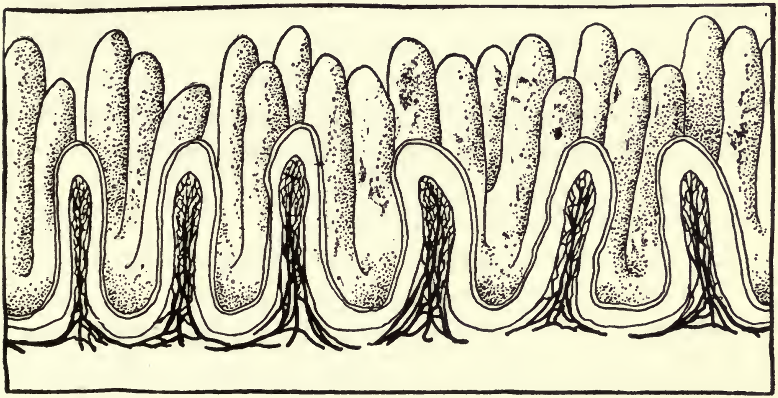
The digestive juices which are poured into the small intestine are the *pancreatic juice* and the *bile.* The pancreatic juice carries on the digestion of the starches and sugars, the proteins, and the fats and

oils. The bile assists in the digestion of the fats and oils.

Digestion in the small intestine goes on until the food is completely digested and made ready for absorption into the blood stream.

Absorption in the Small Intestine

The digested food is carried to the different parts of the body by the blood. The process by which this



"Villi" in the small intestine as they would look under a powerful magnifying glass. These tiny, finger-like projections perform the important work of absorbing the digested food.

food gets into the blood stream is called *absorption.* Some little absorption probably takes place in the stomach and a little more occurs in the large intestine, but most takes place in the small intestine.

The entire inner surface of the small intestine is covered with great numbers of hair-like tubes or "*villi*" which extend inwards. See illustration on previous page. Each of these "villi" contains a tiny blood vessel and a lymphatic duct called a lacteal. As digestion proceeds, the food is moved about by contractions in the walls of the intestine. This brings the digested proteins, starches and sugars, fats and oils in direct contact with the villi so that they will pass right through the thin walls of the blood vessels and lacteals which are there for just that purpose. These tiny blood vessels and ducts then unite to form larger ones, carrying the digested foods to the different parts of the body where they are needed.

The Work of the Large Intestine:

All the undigested and unabsorbed parts of the food pass out of the small intestine into the large intestine. This material enters the large intestine in a thin, watery condition, but before long a large part of the water is absorbed by the blood. Small portions of digested food that may have escaped absorption in the small intestine are also absorbed here. That which is left collects in the large intestine and is sent out of the body at intervals as waste material.

Importance of Regular Elimination of Body Wastes

The waste materials of digestion form poisons in the large intestine if they are allowed to accumulate and remain too long. These poisons are absorbed by the

blood and are carried to other parts of the body where they are likely to cause harmful results.

It is so important to form regular habits in the matter of the elimination of body wastes that the following helpful suggestions are repeated here in this connection:

(1) *Form the habit of going to the toilet at regular times.*

Drink lots of water

(2) *Drink a glass of water before breakfast* and take additional glasses between meals.

(3) *Exercise regularly,* out of doors, if possible.

(4) *Include some coarse, bulky foods in the diet.* These will stimulate the muscles which assist in the elimination of this waste material. Important among such foods are green

vegetables, the bran of cereals, whole-grained cereals, and fruits, with their skins, if possible.

These suggestions are helpful in relieving conditions of constipation.

How We Can Aid Digestion:

In ordinary health the processes of digestion go on day after day without much thought and attention from us. We become aware of them only when something goes wrong and indigestion or other disorder has occurred. There are a few things that are within our control. Some of the most helpful are mentioned below:

(1) *Select the foods wisely.* Do not overload the stomach with too much food nor with those which are hard to digest.

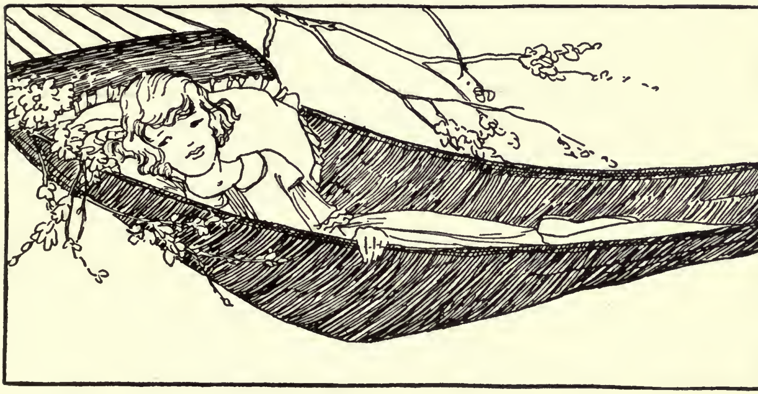
(2) *Chew foods thoroughly.* This will relieve the stomach of the necessity of breaking up many unchewed portions.

(3) *Drink enough water to furnish all that is needed for digestion.* A glass of water before and after a meal, if none is taken with the meals, will provide the stomach with a part of the supply it needs in the softening and dissolving of foods and help the whole digestive process as well.

Drinking water with meals is not considered harmful unless taken in excessive

amounts or used to wash down the foods. The water should be swallowed between mouthfuls and not with them. In this way the saliva will not be diluted too much and its action upon the starches weakened.

(4) *Rest quietly after meals* in order that digestive organs will not be interfered with and their blood supply diminished.



The wonderful "machinery" of our body deserves the best possible care. Rest after meals is an important part of the care of our digestive organs.

THE LIVER

The liver is the largest gland in the body, weighing from about three to four pounds. It is located in the abdomen and has several important uses which are closely connected with the processes of digestion.

Uses of the Liver:

The liver receives a plentiful supply of blood. A large amount of this is venous, or impure, blood which is loaded with waste materials which have been collected from the tissues. It is one of the duties of the liver to remove some of these waste materials and make them ready for elimination.

The blood which comes from the small intestine with its rich supply of digested food materials passes through the liver before it is pumped around the body by the heart. The cells of the liver act upon the sugar which has been absorbed and change it into a form best suited for producing heat and energy. It further acts as a check upon the distribution of this sugar throughout the body. Whenever there is more sugar absorbed than is needed by the tissues at the time, the liver removes the extra amount from the blood and stores it up within itself. Then when the body has a later need for it, this sugar is released and used up in the production of heat and energy.

The liver also secretes the *bile*. This is a digestive juice which is poured into the small intestine and which aids in the digestion of the fats and oils.

Alcohol Injures the Liver:

Alcohol is especially harmful to the liver. The continued and excessive use of alcohol injures its cells and interferes seriously with its important duties.

Helpful Things to Do

1. Make a diagram of the alimentary canal.

2. Compare the length of time it takes to chew thoroughly a number of different foods. Does it take longer with some foods than others?

3. Describe the feelings when a particle of food "goes down the wrong way," as we say. What precautions will usually prevent this?

4. Observe a horse swallowing. Note the movements of the muscles of the throat.

5. Examine the lining of the alimentary canal of an animal. This is sold in stores as "tripe." Describe its appearance.

6. Examine the liver of an animal as sold by the butcher. Note its large size. What indications are there of a plentiful blood supply to the liver? Ask a physician to describe some of the harmful results of alcohol upon the liver.

Health Problems and Questions For Discussion

1. What is meant by the process of digestion?

2. What is the use of the alimentary canal?

3. Why should food be chewed thoroughly before swallowing?

4. What effects upon digestion are likely to result from the loss of several teeth?

5. What is the use of the saliva?

6. Why is food churned slowly in the stomach?

7. What is the gastric juice? What is its use in the process of digestion?

8. What digestive juices are poured into the small intestine? What are their uses?

9. The sight and smell of food usually cause the secretion of some of the digestion juices. Of what value is this?

10. What is meant by the "absorption" of digested food?

11. Describe the villi.

12. Why is it so important that the wastes of the body be eliminated properly?

13. Name some foods that help to regulate the process of the elimination of these wastes. Which of these do you include regularly in your diet?

14. Name three uses of the liver. What effect does alcohol have upon the liver?

15. What cautions should be followed in taking water with meals? Why?

16. Why is it important to rest quietly after meals?

CHAPTER XIV

THE TEETH

The teeth play an important part in keeping the body in health. They repay us well for keeping them in good condition.

USES OF THE TEETH

People sometimes refer to the teeth as "servants" of the body. There are several reasons for this comparison, three of the most important of which are as follows:

(1) They Aid Digestion.
(2) They Help in the Production of Speech.
(3) They Influence Our Appearance.

How the Teeth Aid Digestion:

The teeth bite and grind the food into small particles. An inspection of our own teeth or pictures of teeth will show how well they are adapted to these purposes.

Our front teeth have sharp, chisel-like edges, especially adapted to biting. In grass-eating animals, like the cow and horse, these biting edges are quite large, strong, and well-developed. The front teeth of flesh-eating animals like the tiger, cat, and dog, are more pointed. They are used for tearing rather than biting.

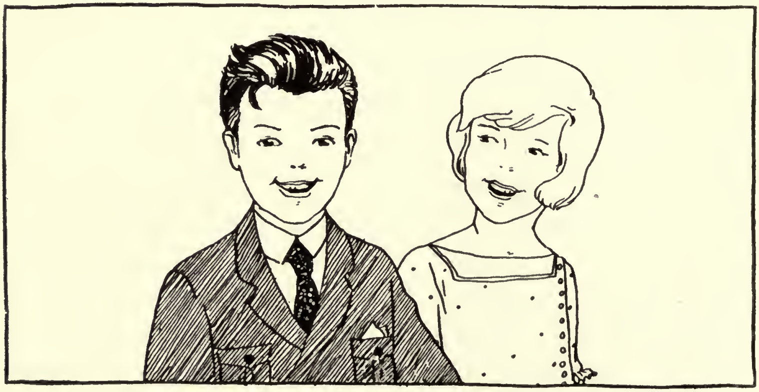
Our back teeth have broad, uneven tops. They crush and grind the food between them much like the millstones that grind wheat into flour. Each of these teeth should have one opposed to it in the opposite jaw so that the grinding can take place between them. Care should be taken to prevent the loss of any of these sturdy, hard-working teeth.

The Teeth and Speech:

The teeth help in the formation of a number of sounds we use in our speech. The spaces left when some of them are removed interfere with the proper formation of these sounds. This is especially true of the front teeth.

The Teeth and Our Appearance:

The teeth have an effect upon our appearance. People never tire of admiring a beautiful set of even,



"Smiling Teeth" are teeth like these

white teeth. Stained and discolored teeth have quite an opposite effect. It is impossible to hide such a condition all the time. It is much easier to clean the teeth regularly and preserve their natural whiteness.

STRUCTURE OF THE TEETH

From our earliest knowledge of the teeth, we have learned to know them as little, hard, glistening-white bodies, securely fastened in the jaw-bones and gums. Each tooth, however, is composed of several different substances and consists of a number of parts. A knowledge of the nature of these substances and their arrangement, as shown in the diagrams, and described in the succeeding paragraphs, will be helpful to us in providing the teeth with the best possible care.

Parts of a Tooth:

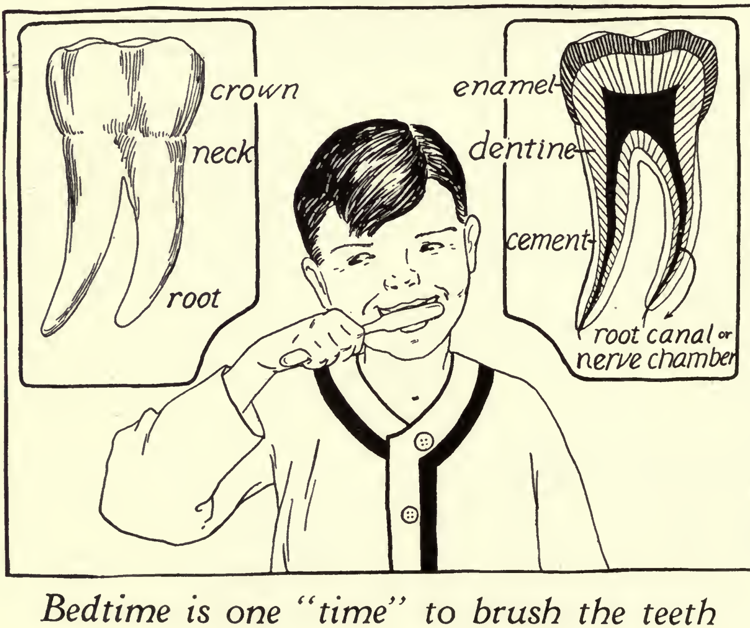
Each tooth has three principal parts, arranged as follows:

(1) The *crown* is the part of the tooth that is seen in the mouth outside the gums.

(2) The *root* is the part beneath the gums. Some teeth have but one root, while others have two or three. Each root is firmly fixed in the jaw bone and gums and holds the tooth securely in place. A little hole, or opening, at the end of each root forms a place of entrance for nerves and blood-vessels.

(3) The *neck* is the place where the crown and root meet. The tooth is usually narrowed a little at this point.

Parts and Structure of a Tooth



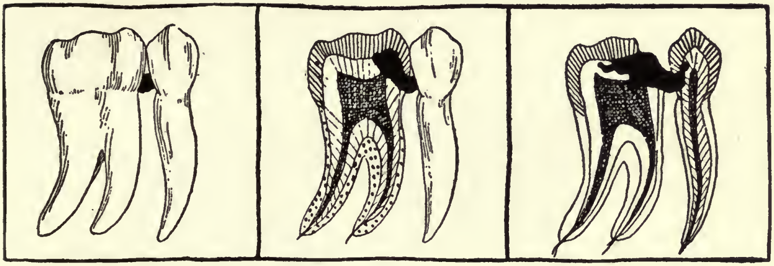
Bedtime is one "time" to brush the teeth

Composition of a Tooth:

Several different kinds of substances enter into the composition of a tooth. These are as follows:

(1) The body, or largest bulk of a tooth, is composed of a hard, white, ivory-like substance called *dentine*.

(2) The dentine is not hard enough to stand the shocks of biting and chewing, so the crown of each tooth is covered with a layer of *enamel.* This enamel is the hardest substance in the body. It is brittle, however, and is likely to crack or chip off whenever hard things like nuts or hard candy are bitten.



How decay will spread from tooth to tooth

(3) Underneath the gums the dentine is covered by a thin layer of a bone-like substance called *cement.* This is not so hard as the enamel because it is not subjected to the work of biting and chewing.

(4) Inside the dentine and extending down through the center of each root is a small cavity filled with a substance called *pulp.* This pulp contains the nerves and blood-vessels with which each tooth is supplied.

GROWTH OF THE TEETH

The teeth begin their growth and development underneath the gums and push their way through them at certain times. The first twenty teeth form a *temporary* set because they gradually loosen and come out to make way for those of the second, or *permanent* teeth which replace them.

The Temporary Teeth:

The first tooth in the temporary set pushes its way through the gum when a baby is about six months old. By the end of the second or third year the entire twenty have usually appeared, ten in the upper jaw and ten in the lower jaw.

About the sixth or seventh year the first of the temporary teeth begin to loosen and come out. This makes room for the permanent teeth which push through to take their places. The remaining temporary teeth come out at various times up to about the age of ten or eleven, by which time usually they all have been shed.

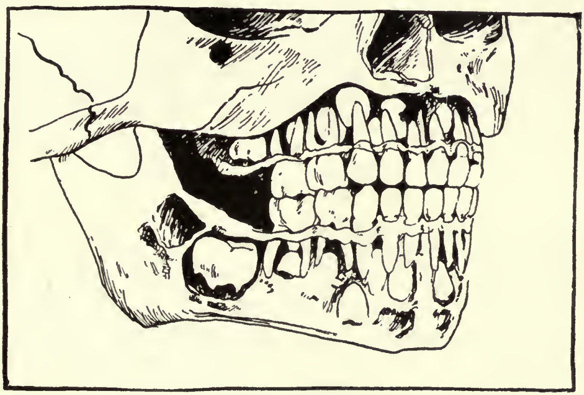
It is important to take good care of the temporary teeth. Many people think that because they are going to come out a little later, it is not necessary to look after them so carefully as those of the permanent set. This is unfortunate, for if a temporary tooth decays and comes out too soon, the permanent one that replaces it is very likely to appear out of line with the others. Many needless irregularities in

the permanent teeth are caused by **neglect of** the temporary ones.

The Permanent Teeth:

The permanent teeth grow underneath the gums, back of the temporary teeth, and push their way through at various times between the sixth and the twenty-first years. There are thirty-two teeth **in our** second, or permanent, set and with good care they

Permanent and Temporary Teeth



The permanent teeth form underneath the gums and push through to take the places of the temporary teeth. The permanent teeth can be seen underneath the gums in this diagram. Take good care of the temporary teeth so that the permanent ones will come in regular and straight.

should serve us during the entire remaining years of our life.

The first permanent teeth that appear are the *six year molars,* so called from the fact that they push their way through the gums when a child is about six years of age. Their position in the jaw* makes it easy to mistake them for the temporary teeth and often results in their neglect. The early loss of the six year molars is often followed by irregular teeth or even changes in the appearance of the face itself.

Other permanent teeth push through from year to year until about twenty-four to twenty-eight have made their appearance by the age of thirteen or fourteen. The last four usually appear between the seventeenth and the twenty-first years or even later and are often called the *wisdom teeth.*

Importance of Good Teeth:

Dentists tell us that there are more differences in teeth than their shape, arrangement, and appearance. They find the enamel on the teeth of some persons to be so hard and thick that it is slow, difficult work to grind it away with their hardest drills, while on the teeth of others, it is much softer and chips and wears away too easily.

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*See Number 7 of the "Helpful Things to Do" at the end of the Chapter for the location of the six-year Molars.

Good teeth are strong, hard, and sound. They are needed for the proper chewing of food and for mixing it thoroughly with the saliva. Such teeth do not decay easily, and for this reason they prevent the injuries to the health that often occur when the poisons from a decayed, or infected, tooth are poured into the blood stream and are distributed throughout the body. Good teeth also relieve us from the pain, trouble, and expense that come from the decay of weak and neglected teeth.

WHAT DETERMINES GOOD TEETH

Whether the teeth will be strong and sound when they make their appearance and will remain in this desirable condition depends upon a number of things. Three of the most important of these are as follows:

(1) The *kind of food,* or *"building material"* that is supplied to them during the period of their growth and development.

(2) The *exercise* they get from the thorough chewing of foods.

(3) The *care* that is taken of them after they make their appearance through the gums.

Foods That Build Good Teeth:

It is hardly necessary to ask which is the better house, one that is built from good materials or one from poor materials. This is just as true of the teeth as it is of a house, for foods that are rich in

lime and certain other substances, build better teeth than foods that do not contain enough of them.

Teeth need a plentiful supply of lime during the time they are growing and developing. The most important foods for supplying this lime and the other substances needed by the teeth at this time are milk, leafy, green vegetables, like spinach, and lettuce, other vegetables, fruits, whole wheat bread, and whole grained cereals. Milk, especially, is valuable for this purpose. Growing children should drink at least a quart, or four glasses, a day, some of which can be taken in other foods and the remainder as a beverage. Raw fruits should be eaten with their skins, wherever possible, so that the valuable teeth-building substances in the skins will not be lost.

It should be remembered that the permanent teeth begin to grow and develop underneath the gums very soon after birth so that it becomes most important to provide the proper nourishment for them during all the years of growth. After they make their appearance, it is too late to make up for all the lack of proper foods before that time.

Exercise Benefits the Teeth:

The exercise that comes from chewing foods thoroughly benefits the teeth. Medium hard foods like crusts of bread and toast are valuable for this purpose. These, together with raw fruits and their skins,

and raw vegetables, like lettuce and celery, exercise the teeth and help to clean and polish them as well.

The Teeth Deserve Good Care:

The teeth work hard for us and deserve all the care and attention that is needed to keep them in good condition. Even sound, strong teeth will decay if neglected. They need to be cleaned regularly, protected from the injuries that result from biting hard things, and should be inspected frequently by a dentist to prevent serious defects from getting a start.

Why a Tooth Decays. Little particles of food that are allowed to remain on the teeth or to lodge between them form the starting point for most cases of decayed teeth. Destructive germs start to grow, harmful acids are formed, and sooner or later a hole is eaten in the enamel. When the softer dentine beneath the enamel is reached, the decay becomes more rapid. Before long a toothache gives warning that the decay has reached, or is very close to, the pulp cavity where the nerves and blood vessels are located. If there should be a crack or break in the enamel to start with, the decay is very much more rapid.

A tooth that has started to decay is very hard to keep clean because it is almost impossible to remove all the food particles that get down into the decayed part. This is very unfortunate because it usually

results in the starting of another hole in a perfectly sound tooth next to it.

Keep the Teeth Clean. Cleanliness of the teeth is one of the best protections against decay. Brush the teeth after meals and just before going to bed. Use a good tooth powder or paste. If the teeth could be brushed but once a day it would be most useful to do it just before going to bed in order to prevent the decay that might go on during the hours of sleep.

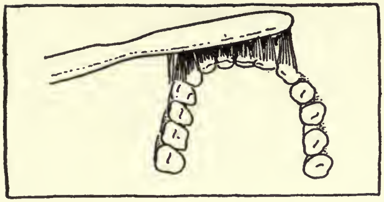
In cleaning the teeth we should be careful not to miss any of their surfaces. Work out a good plan and then try to follow it the same way every time. The Tooth Brush Drill described in Book One is splendid for this purpose. Such a plan divides the movements needed for the proper cleaning of the teeth into three principal parts, as follows:

(1) Cleaning the *outside surfaces.*

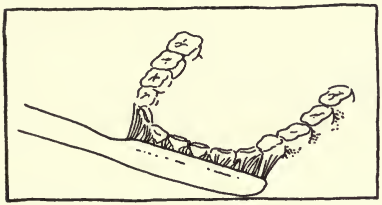
(2) Cleaning the *inside surfaces* and the *roof of the mouth.*

(3) Cleaning the *tops or grinding surfaces.*

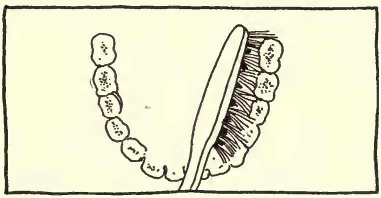
In cleaning the *outside surfaces* of the teeth use a circular or rotary motion with the brush. Keep the brush moving along from tooth to tooth somewhat as the pen moves along in making continuous ovals in handwriting. During this motion some of the bristles will be pushed in between the teeth and clean these parts as well.



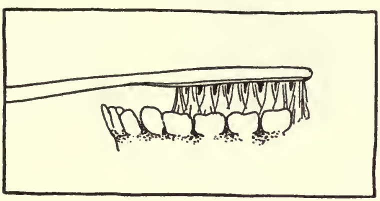
Brush the upper teeth and gums downward, away from the gums.



Brush the lower teeth and gums upward, away from the gums.



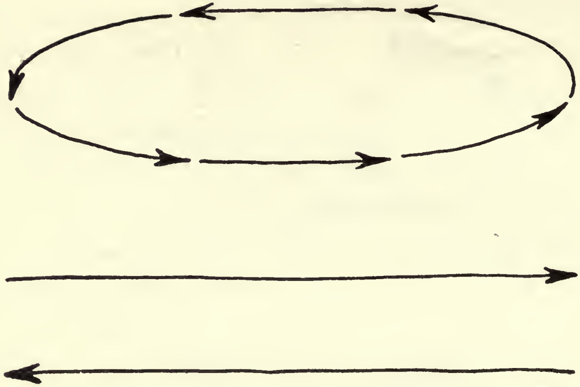
Be sure to clean the back surfaces of the last (end) teeth.



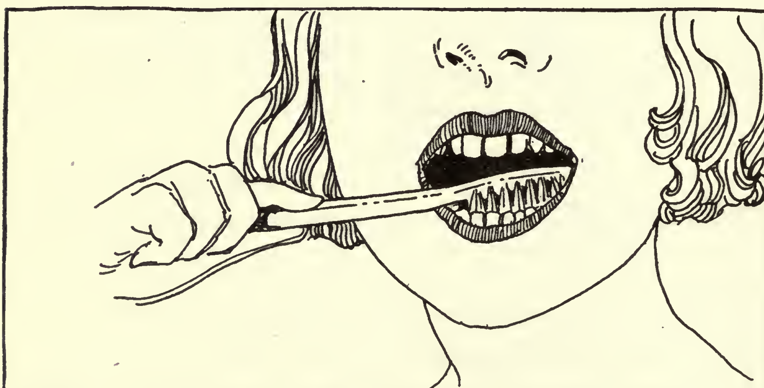
Brush the top surfaces of the back teeth, too.

Courtesy of the Pro-phy-lac-tic Brush Company, Florence, Mass.

Clean the *inside surfaces* by brushing them with an in and out or forward and backward movement. Be sure to reach all the way back. Also clean the roof of the mouth by a few light strokes of the brush.



Use rotary motion in brushing the teeth—Left to Right



Getting at the inside surfaces

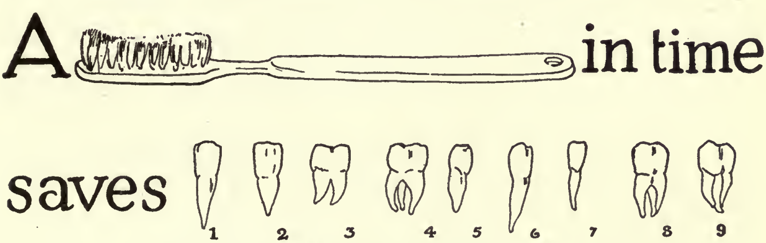
Clean the *tops of the grinding surfaces* with a straight in and out movement. These broad, uneven tops easily catch and hold particles of food and must not be neglected.

In cleaning the teeth, use a fast but a light stroke of the brush. This will stimulate the gums, whereas pressing on too hard will often cause them to bleed.

Make sure that all particles of food are removed from between the teeth. This can be done by passing a piece of *dental floss,* or thread, between them.

It is very important for each person to have his or her own tooth brush. Wash it frequently. Keep it in a clean place.

Protect the Teeth From Injury. Do not bite nuts or other hard things. This will do much to prevent the cracking and chipping of the enamel. Such injuries to the teeth lead to their early and easy decay.



Courtesy of the Metropolitan Life Insurance Co.

Prevent Defective Teeth From Getting a Start. Visit a dentist at least once every six months to have your teeth examined. Some people think that once in three months is safer. A tooth does not hurt until the decay has eaten its way deep into it. Regular visits to a dentist will enable him to discover any little holes that may be just beginning. These can then be filled without pain and with but little trouble and expense.

More often the dentist will find nothing to do and you will have the satisfaction of knowing that your teeth are in the best possible condition.

Helpful Things to Do

1. Examine your own teeth before a mirror or observe the teeth of a friend to see how well they are suited to do the work for which they are intended. Note especially the chisel-like biting edges of the *incisors,* or front teeth, and the broad, flat, irregular tops of the *molars,* or grinding teeth.

2. Study and copy the diagram of a tooth. Compare its structure above the gums with that below the gums. Why is the dentine covered with enamel above the gums and with the softer cement material underneath the gums?

3. Prepare posters to show the important foods that help to build good teeth.

4. Draw a series of diagrams illustrating several stages in the decay of a tooth. Show also how the decay may spread to a sound tooth next to the decaying one.

5. Practice cleaning the teeth in the same way each time. Count as you do it, if necessary. Use a watch to make sure you keep at it long enough and not hurry through.

6. Join in making a class record of the number of

children owning their own tooth-brushes and who use them regularly.

7. See if you still have the *six year molars*—the first permanent teeth that arrive at about the age of six years. The six year molar is the sixth tooth each side of the middle line of both the upper and lower jaws. Help others at home and elsewhere to learn that these six year molars must be carefully looked after in little children, because they are the permanent teeth and will not be replaced later, like the temporary ones.

Questions and Health Problems for Discussion

1. Describe each of the three uses of the teeth.

2. In what ways do the shapes of the teeth help in preparing food for digestion?

3. Name and locate the parts of a tooth.

4. Describe the structure of a tooth.

5. What foods contain "building-materials" for the teeth? Why is it so important to include these in the diet? Can you explain why nursing mothers are especially urged to eat them?

6. What foods are especially valuable for the exercise they give to the teeth?

7. Discuss several reasons for keeping the teeth clean and sound.

8. What causes a tooth to decay?

9. Describe the three groups of movements of the tooth brush in brushing the teeth thoroughly.

10. Why is it suggested that persons visit a dentist at least once every six months to have the teeth examined?

11. What are the temporary teeth? The permanent teeth? How many teeth in each set?

12. Why is it so important not to lose any of the temporary teeth too soon?

13. Why is it so important to take good care of the "six year molars", or the first permanent teeth?

CHAPTER XV

THE BLOOD AND ITS CIRCULATION

The blood forms a great transportation system for our bodies, carrying nourishment to the tissues and removing waste materials. Composed largely of water, it has all the advantages that go with this form of transportation.

The blood and its circulation resemble a city water supply system in a number of ways.

In a city, the water flows through a system of mains and pipes, forced on its way by pumps which are located at the proper places. In our body, the blood circulates within a network of vessels, called arteries, veins, and capillaries, and is kept in motion by the action of a pump, called the heart.

Uses of the Blood:

In its circulation around the body the blood performs several important duties:

(1) *It carries oxygen and food* to all parts of the body.

(2) *It collects waste materials* from the tissues and carries them to the proper places for elimination.

(3) *It helps in the regulation of the heat of the body.* (See Chapter II: "The Skin," pages 17-20.)

COMPOSITION OF THE BLOOD

The blood we usually see is that which flows from cuts or wounds or collects from freshly cut meats. It appears as a reddish, watery liquid which flows easily when it is fresh. Under a microscope it is found to contain millions of tiny bodies called *corpuscles* which float about in a liquid called the *plasma.* The blood contains two different kinds of these corpuscles named according to their color and known as the red corpuscles and the white corpuscles.

The Plasma:

The plasma is the liquid part of the blood. When blood is allowed to stand for a while in a dish or other container, the solid parts separate from the plasma and settle to the bottom. This leaves the plasma as a clear, colorless liquid composed principally of water.

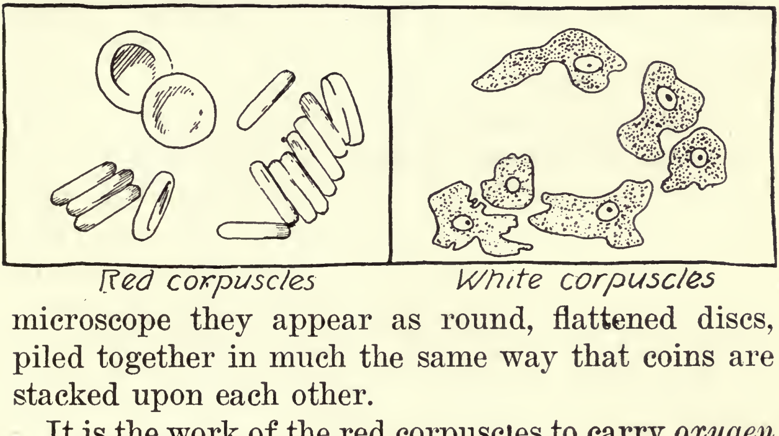
As plasma is pumped through the blood-vessels, it carries the corpuscles along in it. It absorbs digested food materials and distributes them to the parts of the body in need of nourishment. It collects waste materials and transports them to the proper places for their elimination.

Plasma also contains a substance called fibrin, which is valuable in checking the loss of blood from cuts and wounds. When blood is exposed to the air the fibrin begins the formation of a clot which usually stops the bleeding. In deep cuts and wounds from which the blood flows in a swift stream the clots

do not form so easily. In such cases, prompt first aid treatment and medical attention are often needed to assist in forming the clot and to prevent the loss of too much blood.

The Red Corpuscles:

The red corpuscles are little bodies which float about in the plasma. They are so small that a single drop of blood contains millions of them. Under the



microscope they appear as round, flattened discs, piled together in much the same way that coins are stacked upon each other.

It is the work of the red corpuscles to carry *oxygen* to the various parts of the body and to take away a waste material called *carbon dioxide.* They get their fresh supply of oxygen in the lungs and receive their burden of waste materials in the tissues in exchange for the oxygen they bring. Blood as it comes fresh from the lungs is bright red because of the oxygen the corpuscles are carrying. After they give up this oxygen to the tissues and receive the waste carbon

dioxide in return, the corpuscles lose their bright red color and become darker. This changes the blood into that dark, reddish hue that we always think of in connection with "impure" blood, or blood which is carrying off the waste materials of the body.

The White Corpuscles:

The white corpuscles are slightly larger than the red ones and are not so numerous. They have the power of changing their shape and can pass right through the thin walls of the capillaries into the tissues and then back again into the blood.

The white corpuscles form one of our best protections against disease germs which find their way into our bodies. These corpuscles gather in large numbers wherever the germs are found. If the germs are not inside the blood stream they will pass right through the walls of the capillaries into the tissues to reach them. They kill the germs by surrounding or wrapping themselves around them and then digesting and absorbing them. In some cases the corpuscles themselves are killed by the germs. Much of the *pus,* or "matter," that forms in infected sores, cuts, or wounds is composed of the bodies of white corpuscles which have died in the battle against their enemies, the germs.

THE CIRCULATION OF THE BLOOD

In order to serve the body as a transportation system the blood must be kept in motion. It must con-

stantly keep renewing its supply of oxygen and carry off the waste materials without delay.

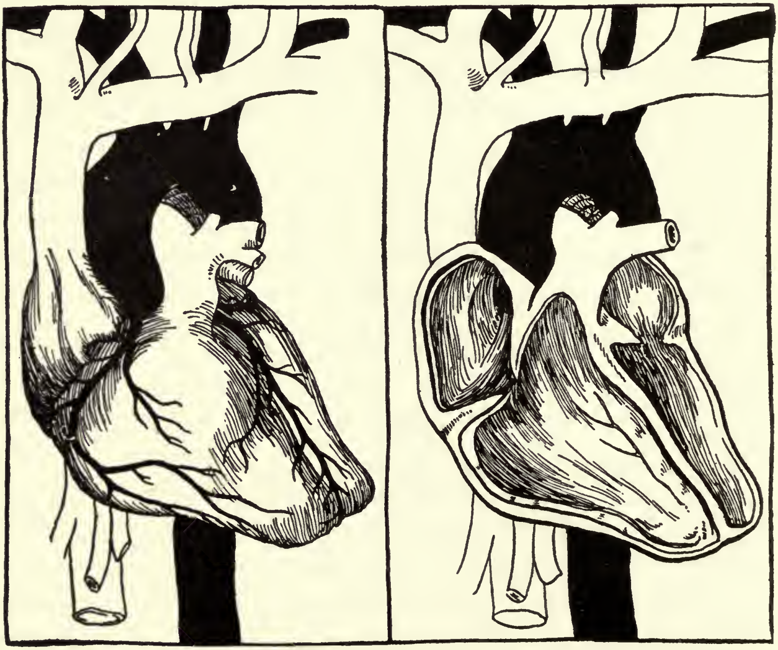
This motion or circulation is kept up by the work of the *heart* which pumps the blood through the tubes or vessels especially provided for the purpose. The same course is followed by the blood in each of its journeys around and around the body. It is pumped from the heart into the blood vessels called the *arteries,* continuing on through the *capillaries* into the *veins* and through them back to the heart again. All the blood in the body amounts to about one-fifteenth to one-twentieth of the body weight, or to nearly three quarts in a person weighing one hundred pounds. You get a good idea of the constant motion of the blood when you know that all the blood passes through the heart and is pumped around the body about three times each minute.

The circulation of the blood has not always been known and understood. It is only about three hundred years since an English doctor named Harvey proved that the blood is in constant motion through the heart and blood vessels. People knew long before this that the blood was necessary to life in some way and that death resulted when the heart stopped beating, but because the blood flows out of the arteries into the veins after death they always found the arteries empty. For this reason they believed them to be carriers of air rather than connected with the transportation of the blood. Their very name,

artery, means air-carrier, and was given to them long before Dr. Harvey discovered their real use.

The Heart:

The heart is one of our most important organs. From birth until death it works steadily on, day and night, year after year, pumping the blood to all parts of the body.



The Heart (Outside View)

The Heart (inside view showing the four chambers)

It is really a hollow muscle situated in the chest cavity, a little to the left of the middle line of the body. It can be located easily by the sound of the heart beat. It is divided into four sections, or chambers, the two upper ones called *auricles* and the two lower ones called the *ventricles.* There is no connection between the right and left halves of the heart.

Blood fresh from the lungs enters the left auricle and passes on into the left ventricle. When this ventricle is filled, its walls contract and pump the blood out into the arteries and through them to all parts of the body. The blood leaves the left ventricle through the largest artery in the body called the *aorta.* This large artery soon divides into smaller ones and each of these divides again and again until the whole body is served by a network of vessels which carry fresh red blood to all its parts.

After giving up the oxygen and food materials to the tissues and receiving the carbon dioxide and other wastes in exchange, the impure blood returns to the right auricle of the heart. It passes on into the right ventricle and is pumped into the lungs by the contraction of the walls of this chamber of the heart. After being purified in the lungs, the blood returns to the left auricle and the process of circulation goes on all over again.

It is interesting to note that the walls of the different chambers of the heart vary somewhat in thickness. The auricles merely collect the blood as it

returns to the heart while the ventricles must pump it out with force enough to send it on its way about the body. The walls of the ventricles, therefore, are thicker than those of the auricles. Furthermore, the walls of the left ventricle are thicker than those of the right ventricle because the blood must leave the left side of the heart with force enough to carry it to all parts of the body while it goes only to the lungs from the right ventricle.

The Valves of the Heart:

The flow of the blood into the auricles, between the auricles and ventricles, and from the ventricles out into the arteries is regulated by a number of valves. The valves which open when the blood enters the chambers of the heart close tightly when the blood is being forced out through other outlets. This prevents blood from escaping backward and interfering with the force needed to send it on its way in the proper direction. The work of these valves is so important that the health of the body is greatly interfered with when they are damaged through disease.

The Arteries:

The blood vessels which carry the bright red blood from the heart to all parts of the body are called the *arteries*. Starting from the aorta which receives the blood directly from the left ventricle, they branch

again and again until every part of the body is served by one or more of them.

The walls of the arteries are tough and elastic. Their toughness enables them to withstand the pressure of the blood as it is pumped through them. Their

The walls of the arteries are strong and elastic, expanding and contracting as the blood is pumped along through them. This expansion and contraction is felt as the pulse.

elasticity permits them to grow larger or smaller in diameter according to the differences in the amount of blood they carry from time to time. During

vigorous exercise, the tissues must be supplied with more blood than they receive during rest. This is due to the greater need for oxygen and food materials, and to the increased amount of the waste materials that must be carried away at such times. In order to satisfy these increased needs, the arteries expand, or grow larger, and carry a greater amount of blood than usual to the active parts. After the exercise is over, the arteries contract and grow smaller again as the need for blood is gradually reduced.

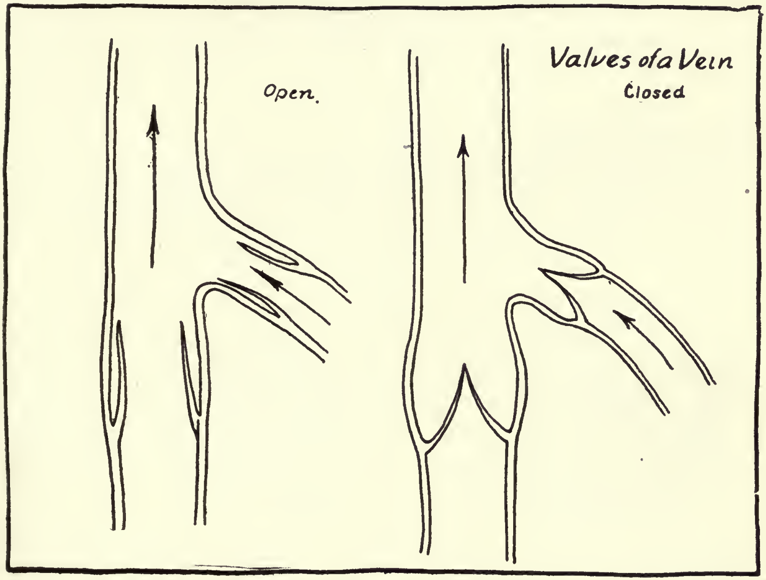
The elasticity of the walls of the arteries is further shown in the regular expansion and contraction that takes place in them with every beat of the heart. Each time the left ventricle contracts, a quantity of blood is pumped out into the arteries. The expansion that takes place at each heart beat and the contraction that occurs between the beats pass along the arteries like the rising and falling of waves in water and are known as the *pulse*. The pulse can be felt by placing a finger over an artery that passes close to the surface of the body, as in the wrist or over the temples, and feeling the regular rise and fall as the blood is pumped on its way.

The Veins:

The blood returns from the tissues to the heart in another set of vessels or tubes called the veins. Large numbers of tiny veins are distributed all through the body. These gradually unite, forming fewer but

larger vessels as they come nearer the heart, until all the blood enters the right auricle through one large vein. This branching of the veins is similar to that of the arteries except that the blood flows towards the heart in the veins and away from it in the arteries.

The walls of the veins are not so tough or elastic as those of the arteries because the blood is not under so much pressure as it flows along through them.



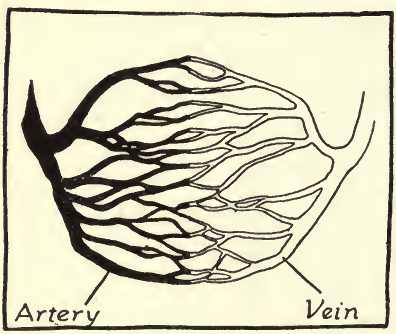
Cross-section of a vein, showing the valves. As the blood flows toward the heart, these little flaps lie close along the walls of the veins, but swell out and prevent the blood from flowing in the opposite direction.

All veins are supplied with numerous valves which allow the blood to flow easily toward the heart but prevent a backward flow. These valves are little flaps which are fastened to the walls of the veins. As the blood flows toward the heart they lie flat along the walls of the veins, but if the blood starts backward they fill out and stop the flow in the wrong direction.

The blood that flows through the veins is dark red. It has given up its oxygen and food materials and has taken carbon dioxide and other wastes in their places.

The Capillaries:

In passing from the arteries to the veins the blood goes through a network of tiny hair-like tubes or



Capillaries form a network of tiny blood vessels between the arteries and the veins.

vessels called the *capillaries.* These capillaries are found in all parts of the body. They are so numerous in the skin that it is almost impossible to pierce the skin at any point without breaking into some of them and causing the appearance of a few drops of blood.

It is while passing through the capillaries that the blood gives up its oxygen and food elements to the tissues and receives the waste materials in their places. The walls of the capillaries are so thin that the plasma of the blood can pass back and forth through them into the tissues. In this way the food materials are brought right to the cells and the waste materials promptly removed.

The Work of the Lymph. After the plasma of the blood has passed out through the walls of the capillaries into the tissues it is called *lymph.* This lymph then flows about, or bathes, the cells of the body, nourishing them and taking the body wastes in return.

A part of this lymph passes directly back through the capillary walls into the blood stream and flows on through the veins toward the heart. Some of it is collected and passed on through another system of tiny tubes called the lymphatic ducts before it finally reaches the blood. Like the other vessels of the body these tiny ducts unite to form larger ones until all the collected lymph is poured through a single duct into one of the larger veins of the body. This system of lymphatic ducts helps to prevent the clogging up of the tissues with lymph which would occur whenever it passed back through the capillaries too slowly.

IMPORTANCE OF GOOD CIRCULATION TO HEALTH

A strong and vigorous circulation of the blood is quite as essential to health as proper food and fresh air. Proper food and fresh air help to make good rich blood. This must then reach all the tissues of the body promptly and regularly in order to nourish and strengthen them. A sound heart and strong and elastic blood vessels form a transportation system which carries these essential elements vigorously to all parts of the body. Waste materials are quickly carried off at the same time and not allowed to clog up and poison the tissues.

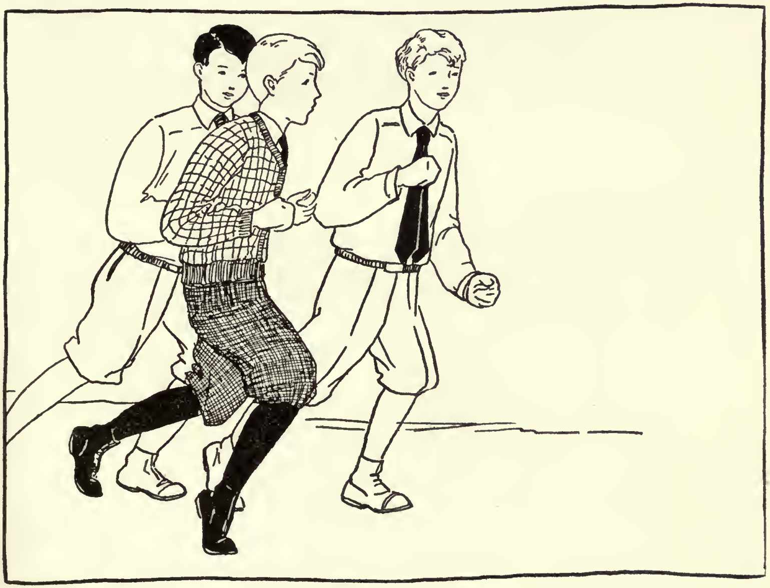
Exercise Strengthens the Heart and Improves the Circulation:

A strong and vigorous circulation of the blood depends upon the strength and healthy condition of the heart and the blood vessels.

As the heart and blood vessels are largely composed of muscles, moderate exercise will strengthen them and do much to keep them in a healthy condition. Many kinds of play, games, and other exercises are suitable for these purposes, provided they are not carried to excess. Overwork and overstrain are injurious to the muscles of the heart.

Slow running is an exercise that is especially valuable to strengthen the heart and improve the endurance. It is best to begin with short distances and

increase them only when the heart grows stronger and no bad effects appear. Ten to fifteen year old pupils might well work up to a daily program of running slowly from two hundred to three hundred yards and then possibly repeating it when, after a period of slow walking, the heart action has returned again



Exercise strengthens the heart and improves the circulation.

to normal. Once a day, however, will be sufficient for this form of exercise and it should not be taken at all if any bad effects appear or if a physician disapproves of it.

Over Exercise and Overwork Injure the Heart:

Continued over exercise and overwork at any age are injurious to the heart. This is especially true during the years of growth when the heart is growing along with the rest of the body.

During exercise, the muscles demand a larger supply of oxygen and food materials, and the heart must beat faster and stronger to meet this demand by pumping more blood through the body. This is readily proved by counting the increased number of heart beats during any period of vigorous exercise or strenuous physical work.

Continued over exercise and overwork do not allow the needed time for rest and recuperation and as a result the heart increases too much in size and really becomes weaker rather than stronger. When it is remembered that moderate exercise and sufficient rest strengthen the heart, it is most unwise to overdo it to the point where one of the most important organs of our body is injured just by carrying such a beneficial practice too far.

Tight Clothing Hinders Proper Circulation:

Tight waistbands, belts, garters, corsets, and other articles of clothing which press upon the blood vessels close to the skin cause a slowing up and a reduction in the amount of blood which passes through them. This interferes with the nourishment of the

parts supplied by these blood vessels and prevents the proper carrying off of waste materials.

Avoid Incorrect Postures:

Incorrect and improper posture often cause pressure upon blood vessels and hinder the regular flow of blood through them. Avoid slouching down in the seat in school. Do not get into the habit of careless and improper positions while studying at home.

Alcohol and Tobacco Injure the Heart and Blood-Vessels:

Alcohol is a poison which injures the muscles of the heart and blood vessels. It causes the blood vessels to expand, and this frequently permits more bodily heat to escape than the body can afford to lose. In cold climates alcohol is especially dangerous because of this effect. Tobacco disturbs the circulation. It causes the heart to beat irregularly and in cases of excessive use may cause pain in the region of the heart and a feeling of rapid and fluttering heart beat.

First Aid in Bleeding. In most cases where cuts or wounds are slight, the normal clotting of the blood will soon check its flow. In severe cases, other means will have to be taken and it is always wise to secure prompt medical attention to prevent serious or even fatal results.

In bleeding from arteries, the blood is bright red and flows out in jets and spurts. In stopping arterial

bleeding, pressure should be applied over the artery between the heart and the cut or wound. A tight bandage, string, or belt will usually serve for the purpose.

In bleeding from veins, the blood is dark red in color and flows forth in a steady stream. In

Nose-Bleed is a rather common accident calling for First Aid treatment. Packing the nostril with cotton soaked in cold water is often effective in stopping it.

order to stop such bleeding, pressure should be applied over the veins on the side of the cut away from the heart or between the extremities of the body and the cut or wound. Bandage the wound tightly. This will bring the edges together and assist in the formation of the clot which will often check the bleeding.

Secure medical assistance whenever necessary to prevent a loss of too much blood.

Nose bleed is often stopped or relieved by packing the nostril with cotton or bandage which has first been soaked in cold water. Snuffing cold water up the nose will give some relief in ordinary cases.

Form the habit of sterilizing all cuts and wounds. Keep iodine or other similar preparation handy for this purpose. This will kill the germs that often find their way into the body through such breaks in the skin.

Helpful Things to Do

1. Obtain the heart of an animal in a butcher shop. Note the thickness and strength of the walls of the different chambers, or cavities, in it. What other interesting things can you discover from your observations?

2. Locate and count your pulse for a minute. Exercise vigorously for a short time and then count it. How can you account for the difference? Rest a few minutes and count it again. What has happened?

3. Count the pulse in another person before and after exercise.

Health Problems and Questions For Discussion

1. Explain how the blood acts as a transportation system for the body. In what ways is this similar to the city water supply system?

2. Name three uses of the blood.

3. What is the plasma?

4. What is the use of red corpuscles?

5. What is the use of the white corpuscles?

6. What gives blood its color? What makes blood change its color as it circulates through the body?

7. What is meant by the circulation of the blood?

8. The hand or foot often goes to sleep, as it is called, when held in certain positions for a time. Why will gentle rubbing or massage soon relieve the uncomfortable feeling?

9. Describe the heart. What is its use?

10. What is the use of the valves of the heart?

11. What are the arteries? The veins? The capillaries?

12. What is meant by the pulse? Why does a physician count the pulse as one of the first parts of his examination?

13. Why is exercise so beneficial to the heart and the blood vessels?

14. Name some exercises which are helpful in strengthening the heart and blood vessels.

15. What is meant by the clotting of the blood?

16. Why should over exercise be avoided?

17. How does bleeding from an artery differ from bleeding from a vein? Describe the first aid treatment for each case?

18. How can nose bleed often be relieved?

CHAPTER XVI

DISEASE AND DISEASE GERMS

There are few of us who have not experienced some form of illness. Much absence from school and loss of time and money from work are caused by disease. In spite of such losses, one of the most hopeful things about disease is that much of it can be prevented. So much is being discovered all the time about the causes and the means of preventing diseases that we should learn all we can about them.

The cause of many diseases has been found to be due to the growth in our bodies of tiny plant or animal forms called *germs,* or *microbes.* The causes of some diseases are still unknown and doctors and other scientists are working hard to find them out.

What Germs or Microbes Are:

There is a world of tiny living plant and animal forms all about us. They are so small that they cannot be seen except through a powerful microscope which makes them appear hundreds and hundreds of times larger than they really are. The germs which live and grow as plants are called *bacteria,* while the animal ones are given the name of *protozoa.*

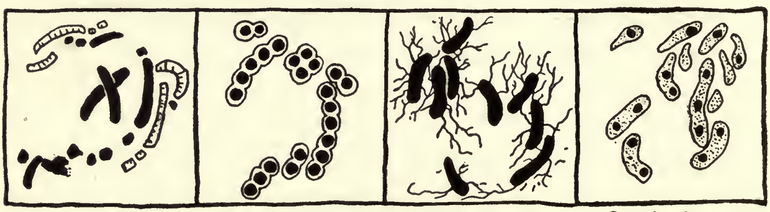
They live by the millions in the air, water, and the soil. They blow around on the dust in the air. They float along in the rivers and streams. They

grow in the dirt, or soil, and are carried from place to place by many things.

Each germ is a single cell which grows and multiplies very fast by dividing into two cells, then each of these into two more and so on until millions result in an extremely short time where growing conditions are favorable.

Germs grow best under conditions of warmth, moisture, and darkness. Sunlight kills them quickly.

Types of Disease Germs



Tuberculosis *Pneumonia* *Typhoid* *Diphtheria*

These are the germs of disease and are among the worst enemies of mankind.

High temperatures destroy them if the heat is kept up long enough. Cold prevents them from growing but does not injure them. Germs which have been frozen will become active again when thawed out and warmed up to the proper temperature for their growth.

The Work of Germs or Microbes:

Many kinds of germs serve a useful purpose in the world. Some cause the decay of dead leaves,

fallen trees, and many other useless vegetable and animal substances. They change cider into vinegar, and make things sour. They cause bread to rise, and so on through a long list of useful things.

Unfortunately, not all kinds of germs are of this helpful nature. Some few, called disease germs, are among the worst enemies of mankind. They are spread and carried from place to place in many different ways, and frequently gain an entrance into our bodies where they may grow and multiply very rapidly.

How Disease Germs Are Spread:

The germs of disease are spread from person to person and from place to place in a number of ways.

Timely use of the handkerchief or the hand in coughing and sneezing lessens the danger of spreading disease germs by these little explosions of air.

Coughing and sneezing spread disease germs. They are carried out of the mouth and nose in the droplets

of moisture that are forced out by these little explosions of air.

Spitting carries germs out of the mouth to the pavement or floor with the moisture that forms the the spit, or sputum, as it is called. When this moisture dries, the germs are blown about very easily on particles of dust, or attach themselves to anything that comes in contact with them.

Dirty and impure foods and polluted drinking water often spread the germs of some diseases from place to place. We cannot be too careful in avoiding dangers from such sources.

Flies spread disease germs by carrying them on the little hairs which cover their bodies. Mosquitoes, rats, and mice also carry and spread the germs of certain diseases, and every effort should be made to exterminate them.

Spread of Contagious Diseases:

Contagious diseases are those which spread more or less easily and rapidly from person to person. Some, like smallpox, measles, diphtheria, scarlet fever, chicken pox, whooping cough, and mumps are very contagious while others, like colds, are less so.

The ease with which they spread makes it important to keep the sick person apart from others. A quarantine is usually established. Warning notices are posted, stating the name of the disease and cau-

tioning all persons to keep away until danger of its spread has passed.

How Disease Germs Enter the Body:

The nose and mouth form convenient openings for germs to get into the body. They enter along with the air we breathe, the food we eat, and the water we drink, or may be carried on the fingers and other objects that are sometimes placed in the mouth.

Cuts and wounds offer an easy entrance. Always sterilize such injuries immediately with iodine or other suitable substance which will kill the germs.

The germs of certain diseases are introduced directly into the blood-stream by the bites of some insects and animals. The mosquito can inject the germs of malaria and yellow fever. The germs of the dreaded hydrophobia get into the body with the bite of a mad dog.

How Germs Cause Disease:

After disease germs gain an entrance to our bodies they find there the conditions of warmth, moisture, and darkness which are so favorable to their growth. Unless something interferes, they begin to grow and multiply rapidly, producing poisons called *toxins*. These toxins are then carried about by the blood, poisoning the cells, interfering with the work of the heart, brain, and other important organs, and causing weakness, discomfort, pain, and even death.

The toxins and germs of certain diseases affect the body in different ways. Some are more poisonous and dangerous than others. The toxin of diphtheria, for example, is extremely poisonous, while that of ordinary colds is not so dangerous or fatal. The toxins and germs of tuberculosis actually destroy the tissue of the lungs or other parts that are attacked. Typhoid germs and toxins do especial damage to the intestines in addition to the weakening of the whole body that is so characteristic of this disease.

THE BODY DEFENDS ITSELF AGAINST THE GERMS

Fortunately for us, most of the disease germs that find their way into our bodies are overcome and killed by the wonderful natural defenses of the body. These defenses include the white corpuscles and other special germ-killing substances found in the blood, and the anti-toxins that are produced whenever they are needed.

The entrance of germs is the signal for the beginning of a lively contest, or battle, between these forces. Very often the germ enemies are defeated before they get a chance to grow and multiply too much. Scars, or marks, are often found in lung tissue, for example, which indicate places where the germs of tuberculosis have been walled up and rendered harmless by these natural defenses, without

the knowledge of the person in whose body it occurred.

Germ-Killing Substances in the Blood:

The blood usually contains substances which have the especial power to kill germs which find their way into the blood stream. To have good, strong, healthy bodies is the surest way of keeping the blood supplied with the largest possible amount of these valuable natural enemies of disease germs.

The Work of the White Corpuscles. The white corpuscles in the blood form one of the best defenses we have against germs. It is the important duty of these little bodies to act as soldiers, or policemen, to protect us against the attacks of enemy germs and to carry on the fight against them.

Whenever disease germs find their way into our bodies the white corpuscles flock to that point in great numbers. They have the ability to change their shape and to pass right through the walls of the blood vessels into the tissues. This enables them to reach any part of the body where germs may begin to grow. The white corpuscles destroy germs by surrounding or wrapping themselves about the germs and digesting and absorbing them into their own substance. A group of corpuscles may attack and absorb a number of germs in the same way.

In the course of this battle, some of the white corpuscles are killed by the germs. A large part of the

pus or matter which forms in and around infected cuts, wounds, or sores is made up of the bodies of white corpuscles which have been overcome and killed in their efforts to kill the germs. Practicing health habits regularly is the best possible aid we can give to the white corpuscles in their growth and in their work. Good nourishing food, vigorous out-door exercise, and proper rest and sleep are especially helpful.

Production of Anti-Toxins in the Body. Whenever germs start to grow they produce toxins or poisons which are carried to different parts of the body in the blood stream. Just as soon as the toxins begin to appear, the body begins the manufacture of a substance called an *anti-toxin* which has the power to stop the poisoning effect of the toxin. The body is not seriously affected if the anti-toxins are made fast enough to overcome the effects of the toxins. It is when the toxins are made faster than the anti-toxins that the tissues and organs of the body become poisoned and sickness and disease result.

We May Become Immune from Certain Diseases. A person who does not "take" a contagious disease or who can resist the attacks of certain disease germs is said to be immune from that disease. Something is present in the body which prevents the germs from getting too great a start in their growth.

This immunity from certain diseases may be natural or it may be acquired by artificial means.

Natural Immunity Against Disease. In cases of natural immunity the body already contains a supply of germ-killing substances and anti-toxins strong enough to overcome the germs of a particular disease. Immediately after recovering from a disease the body is usually immune for sometime against another attack of the same disease. This is due to the continued effect of the anti-toxins and germ-killing substances that are produced during the period of the illness. The length of this immunity varies with different diseases. With some, such as smallpox, measles, diphtheria, typhoid fever, and whooping cough, these substances seem to hold their power for years and we are likely to have the disease but once. In the case of colds, pneumonia, influenza, and others, the protection does not last so long and the disease may recur several times unless prevented in some other way.

Acquired Immunity Against Certain Diseases. Among the most wonderful discoveries of medical science in recent times is the fact that persons can build up an immunity against certain diseases by the use of specially prepared substances called vaccines, anti-toxins, and serums. The number of diseases for which these substances can be obtained is gradually being increased as the result of the efforts of the scientists who give a large part of their lives to this work.

The use of these wonderful preparations in preventing disease will be presented in the next chapter.

Helpful Things to Do

1. Ask a physician who has a microscope and slides of disease germs to let you examine them. Describe their appearance. Such slides can often be seen at the public health office or department that has charge of the inspection of the water supply, or the food supply, or where tests are made in cases of contagious diseases, and so on.

2. Examine a warning notice of a contagious disease. By what authority is the notice posted? Why is it desirable to have the name of this authority appear on the printed notice?

3. Find out all the different diseases that are quarantined in your community. Why are they quarantined?

4. Make a copy of a warning against spitting. Make a list of places where such notices should be posted.

Health Problems and Questions For Discussion

1. What are germs, or microbes?

2. Make a list of some of the useful purposes that germs, or microbes, serve.

3. What harmful things are caused by germs?

4. In what ways can disease germs be spread?

5. How do disease germs get into our bodies?

6. How do germs cause disease?

7. What are contagious diseases?

8. What is the meaning of quarantine? Why is it necessary?

9. Why is it wrong for children living in the same house with a contagious disease to attend school?

10. What is meant by a "toxin"? What is an "anti-toxin?"

11. What is meant by natural immunity against disease? By acquired immunity?

CHAPTER XVII

PREVENTION OF DISEASE

The old proverb that "an ounce of prevention is worth a pound of cure" is particularly true of disease.

The story of how the modern discoveries of doctors and other scientists have replaced the old uncertain guesses and superstitions regarding the causes and cures of diseases is too long to be told here, but is nevertheless most interesting and helpful. When it was believed that malaria was caused by "night air", it was not so easy to prevent it as at present when it is known that a certain kind of mosquito spreads it, and that the destruction of the mosquitoes causes the disease to disappear.

PREVENT THE SPREAD OF DISEASE GERMS

One of the first steps in the prevention of disease is to stop the spread of the germs which cause them. This is not an easy matter, for the germs are so tiny that they cannot be seen without the aid of a microscope and they are spread in so many different ways.

Be Careful in Coughing, Sneezing, and Spitting:

Many kinds of germs find their way into the nose and mouth. Coughing and sneezing force little germ-

laden droplets of moisture into the air and spread them over a considerable space. Form the habit of covering the nose and mouth with the hand or handkerchief at such times to prevent the scattering of the germs.

Spitting carries germs out of the body in the sputum. When the moisture evaporates, the germs are left free to blow about in the dust in the air or to be carried from place to place on anything that comes in contact with them. The only safe way is to deposit the sputum in something that can be burned, or sterilized.

Spitting in public places is usually forbidden by law. Notices are posted to call attention to the dangers of the practice and to announce the penalties for violations. The fact that the law is not always rigidly enforced does not make the bad habit any less dangerous, and much suffering is needlessly caused by such carelessness.

Avoid Dirty and Impure Foods:

Disease germs grow and multiply in dirt. Many foodstuffs are transported long distances and handled many times in the course of their journey from farm or factory to our tables. Great care must constantly be taken to keep foods pure and clean at every stage of such a journey.

It is especially important to take proper care of foods that are spread out in stores for inspection.

They should be protected from dust and flies. Disease germs float about in the air on the little particles of dirt which form the dust. Flies carry disease

A storekeeper who protects his wares from dust and flies protects your health as well. He deserves your patronage.

germs from place to place and leave them on anything they touch.

The final precautions against introducing disease germs into our bodies in our food and drink must be taken in the course of their preparation for the table. Wash and clean foods thoroughly before eating.

Continue the cooking of foods long enough to make sure that all the germs are killed by the heat.

Making Milk Safe:

Great care must be taken with milk to prevent it from spreading disease, for milk is just as fine a food for germs as it is for us. Typhoid fever, diphtheria,

Milking-room in a Sanitary Dairy

Milk is an excellent food for germs as well as for us. The greatest precautions must be taken in every part of its production to prevent disease germs from getting into it.

tuberculosis, tonsilitis, and other diseases can often be traced to some carelessness in handling milk.

In their efforts to make milk safe, most communities regulate by law its production and distribution. They provide inspectors to see that dairies are kept clean and sanitary. They arrange for the testing of cows at certain intervals to make sure that they are free from disease. They require that the milk be kept cool while it is being transported, for coolness slows down and prevents the growth of germs.

As an additional precaution most milk is then *pasteurized* before it is sold. This is done by heating it to a temperature of 145 degrees (F) and keeping it there for half an hour. It must not go above 148 deg. and not fall below 145 deg. This will kill all the dangerous germs but will not destroy the harmless ones which turn milk sour and which are necessary in making butter and cheese.

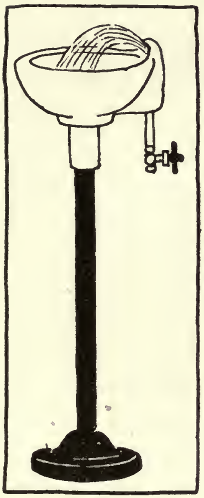
Pure Water Prevents Disease:

Water which has become polluted by sewage and other wastes often contains the germs of disease. Many typhoid fever epidemics have been traced to an impure water supply. Intestinal disorders often result from its use.

Cities that take their water supply from streams containing sewage or other impurities usually filter it before it is used. As the water passes through the

beds of sand or other materials of which the filters are composed, the impurities are removed and it is made safer to use.

Where wells and cisterns are used for the water supply, great care must be taken to locate them where the drainage from the house and barn cannot find its



Drink Lots of Water

A Sanitary Drinking Fountain

A Safe Place to Drink

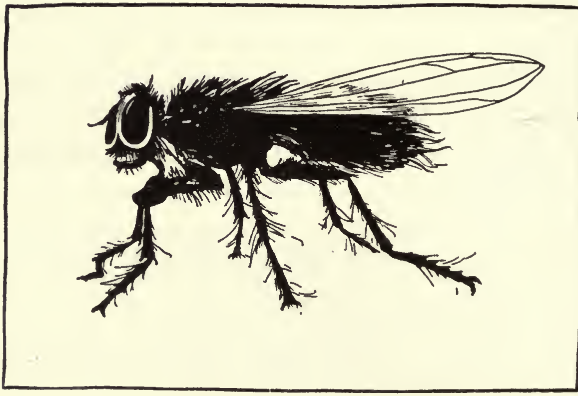
way into them. In all cases of doubt as to the purity of the water it should be boiled before drinking. Germs can withstand cold but they are killed by heat.

Proper disposal of body wastes will go far in preventing disease germs from polluting the water supply. Keep toilets and out-houses in a sanitary

condition. Disinfect them frequently with chloride of lime or other suitable substance.

Some Insects and Animals Spread Disease Germs:

Flies, mosquitoes, and rats are disease carriers. It is not enough to kill or destroy only those that come within our reach, but we should prevent their breed-



A Germ Carrier
BANISH HIM!

ing and growth as well. Diseases can sometimes be traced to household pets which have not been kept as clean as they should be.

The House-Fly is a Carrier of Disease

So long as house flies were considered merely as pests which annoyed us in a number of ways, it was difficult to interest people in killing them and in de-

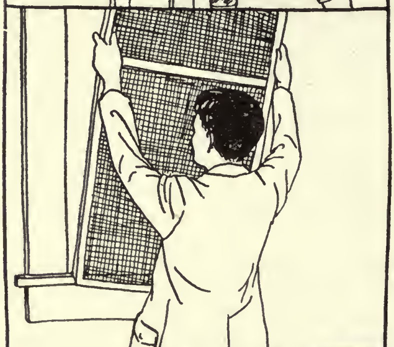
stroying their breeding places. When the microscope showed that the fly carries the germs of typhoid fever, infantile paralysis, intestinal disorders, and other diseases as well, people awakened to the great need of exterminating this pest. "Swat the Fly" campaigns and other similar movements have become more popular.

Where Flies Grow. The favorite breeding place of flies is garbage or manure although any dirty place will serve the purpose, even a piece of dirty cloth or decaying paper. They begin to breed in the spring just as soon as the days get warm, and continue their breeding until the cool days of autumn. They multiply very rapidly. The eggs hatch in a few hours and the maggots, or little white worms, which come out of the eggs are turned into full grown flies in the short space of a week or two.

Prevent and Destroy the Breeding Places. Destroy or remove all empty food cans, decaying collections of rubbish, and all kinds of dirt or filth that may be carelessly left around the home, thus providing places for flies to breed. Provide tight covers for garbage cans. Screen the windows and doors of outhouses. Use antiseptics freely to keep all places clean.

In the country, the barnyards especially need careful watching to reduce and prevent the breeding of flies. Manure should be removed from the stables regularly and kept in screened bins or vaults or on

Swat the fly



Screen the window

Keep garbage can covered. Clean it frequently.

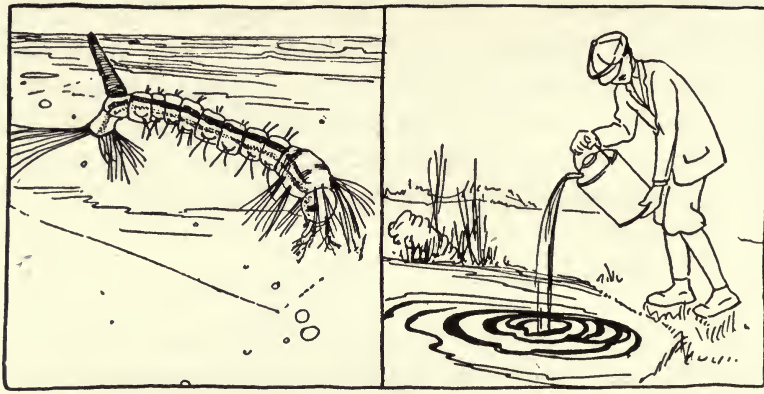
raised platforms. It will assist greatly if the whole collection of manure is treated occasionally with the proper substances to destroy the eggs and maggots.

Screen the windows and doors to prevent flies from traveling back and forth between dirty places outside our houses and the foodstuffs within them.

The Mosquito Can Spread Disease

The mosquito is a pest and certain kinds of them are known to carry the germs of malaria and yellow fever. Yellow fever is rather uncommon in the United States, but malaria is quite common in many places. It is the cause of many deaths and a large amount of sickness and loss of time and money from work each year.

Prevent the Breeding of Mosquitoes. The life habits of the mosquito make it quite possible to prevent its growth. Mosquitoes lay their eggs in water, preferring quiet, stagnant pools rather than the flowing streams. The eggs hatch into little thread-like bodies called "wigglers" which live in the water until time for them to change into the flying, singing nuisance with which most of us are familiar. It is while in the water in the form of wigglers that we have our best chance to destroy them. This is easily done by spreading a thin covering, or film, of oil upon the surface of water in which the wigglers are found. They cannot breathe through this oil and are



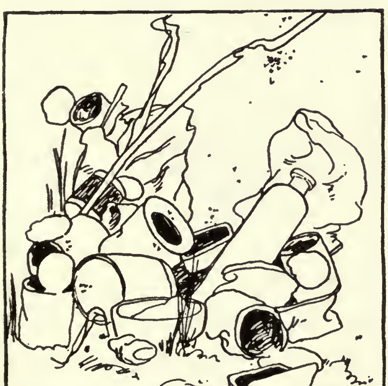
The mosquito larvae must rise to the surface of the water to obtain air. This gives us our chance to kill them by spreading a thin film of oil over the water.

soon destroyed. A small amount of kerosene or crude oil used in this way will gradually spread over a wide area and kill all the wigglers in the water. Repeat the process whenever needed, and the number of mosquitoes will be greatly reduced.

The breeding of mosquitoes about the house can be prevented by removing all empty tin cans, bottles, jars, flower pots, and other articles in which water could collect after a rain. These form excellent breeding places for mosquitoes. Keep all rain barrels covered, and do not allow drains and gutters to become stopped up and hold little pools of water.

In the country or in vacant city lots, the water should be drained out of hollows and swampy places. These should then be filled up to prevent water from collecting in them again. Kerosene or crude oil should be spread over the surface of ditches and all places which cannot be thoroughly drained. Where this is carefully done the mosquito pests have been greatly lessened or removed entirely.

Screen all windows and doors to prevent the entrance of mosquitoes into the house. This will reduce the chances of getting malaria from the bite of the mosquito which carries and spreads the germs of this disease. In tropical and semi-tropical countries, the mosquitoes spread yellow fever germs as well.



A heap of old receptacles, a good breeding place for mosquitoes.

Rats Are Disease Carriers

Rats are one of our most dangerous enemies. They carry and spread disease germs and cause hundreds of million dollars worth of waste each year.

Rats spread the dreaded disease called the *plague,* which is much more common in other countries than in the United States. The germs of this disease live in fleas that the rats carry about on them. It has been found that the quickest way to stamp out the plague is to destroy the rats which are responsible for its spread. In order to keep this disease out of our country, ships which arrive from foreign ports are required by law to use rat guards on all ropes which fasten the vessel to the dock. A circular collar of tin or other metal fastened closely around the rope prevents the rats from getting to the shore by this means.

The bite of rats is dangerous. Prompt medical treatment should be obtained to prevent blood poisoning or other disease which may come from it.

The waste and loss caused by rats is enormous. They dig up freshly planted grain in the fields, destroy it while it is growing, and feed upon it after it is harvested and stored in warehouses and mills. They spoil and destroy fruits and vegetables in the markets. They eat eggs and poultry. They cause disastrous fires by gnawing matches and coverings of electric wires. The list of the damages they do is so large that no trouble or expense should be spared in destroying them.

Rats can be kept away by removing or protecting all foods and garbage upon which they feed. Destroy old sheds, piles of trash, and places in which they can

hide and breed. Make places rat-proof by the use of wire screens, stone, or concrete.

ROUT THE RAT!

Hookworm Disease Is Easily Prevented

In some parts of the country, especially in the South, the *hookworm disease* causes considerable suffering. It makes people feel tired or lazy, and

often unfits them for work. It is caused by a tiny worm which gets into the body through the skin, and lives and grows in the intestines.

It is easily cured. Doctors and Health Authorities everywhere are only too glad to prescribe the very simple and effective treatment which will rid the body of these parasites.

Prevent the disease by keeping toilets and outhouses in a sanitary condition. Do not go bare-footed wherever the hookworm is likely to be found, for a favorite place for it to enter the body is between the toes.

VACCINES AND ANTI-TOXINS PREVENT SOME DISEASES

A number of diseases can be prevented by the use of specially prepared substances called vaccines and anti-toxins. The number of these diseases is constantly being increased through the untiring efforts of doctors and other scientists who devote a large part of their lives to this work.

Vaccination Prevents Smallpox:

Before an English physician named Jenner showed the world that smallpox could be prevented, this disease was one of the most terrible that existed. It spread rapidly from person to person, caused large numbers of deaths, and disfigured the bodies of those who recovered by leaving deep pits or scars in the skin.

Just before the beginning of the 19th Century, Dr. Jenner noticed that dairy maids did not get smallpox so easily as other persons. They seemed to have an immunity against the disease which was not possessed by others. In his search for the reason for this he discovered that they often had a mild and less serious kind of disease called cow-pox. When they recovered from this they could be exposed to smallpox without fear of developing it themselves.

Dr. Jenner continued his experiments by introducing some of the germs or virus of cow pox into the bodies of healthy persons. As the cow-pox developed, the body began the manufacture of anti-toxins and germicides which not only cured the cow-pox but also remained in the body for years and years and prevented the start of the far more dreadful disease smallpox. This led to the preparation of a vaccine which successfully prevents this disease.

Everyone Should Be Vaccinated. Wherever the use of vaccination against smallpox is widely used, the disease seldom if ever occurs. Only now and then a case will develop where there has been some careless omission of the vaccination.

In many places vaccination is compulsory. All soldiers and sailors must be vaccinated. Many cities and states require all children to be vaccinated before being admitted to school. The number of countries requiring vaccination against smallpox is

increasing as the knowledge of its wonderful preventive value spreads.

Vaccination is neither painful nor dangerous. The scratch of a needle is all that is needed to introduce the vaccine into the body. So much care is taken in the preparation of vaccines today that there is but the remotest possibility of infection taking place if proper precautions regarding cleanliness are taken before and after the vaccination. Over one million persons were vaccinated against smallpox in the Philippine Islands in a short period of time and not a single case of infection or other complication developed.

Vaccination Against Other Diseases. Vaccines have been prepared for the prevention of a number of other diseases besides smallpox. One of the most successful and widely used is in the prevention of typhoid fever. Typhoid fever is a germ disease frequently spread by impure water. The typhoid vaccine causes the body to develop an extra supply of anti-toxins and germicides which destroy and prevent the growth of any germs of this disease which may find their way into the blood stream. The use of vaccination against typhoid is increasing as more and more people realize its value. The soldiers and sailors are all vaccinated against it and typhoid fever among them is almost unknown. A favorite time for many people to obtain this protection is just before starting on vacations, because of the uncer-

tainty that often arises regarding the purity of the water supply at such times. It should be remembered that the immunity against typhoid fever from vaccination lasts but a few years and must be repeated whenever necessary. Other vaccines are used to prevent the spread of plague and cholera.

Anti-Toxins Are Valuable in Preventing and Fighting Certain Diseases:

In the case of vaccines, the germs introduced into our own body at the time of the vaccination stimulate it to produce an extra supply of anti-toxins to prevent the disease. In other cases it has been found best to cause the disease and develop the anti-toxins in an animal and then transfer the anti-toxins into our own bodies. They work for us then in the same way that they do in the animal in which they are produced. Anti-toxins are used with success in preventing and combating diphtheria, scarlet fever, tetanus, or lock-jaw, meningitis, and many others.

Before the discovery of the diphtheria anti-toxin, this disease caused a much larger number of deaths each year. Its use right at the start of the disease is wonderfully effective in preventing the serious results that make diphtheria one of the dreaded diseases.

It is also possible to determine whether a person has a natural immunity against diphtheria by the use of the "Schick test," as it is called. In the cases

where no natural immunity is found, the use of a specially prepared "toxin-anti-toxin" will develop an acquired immunity which will be just as effective in preventing the disease and which will last throughout the lifetime. Physicians, Public Health Authorities, Schools, and Child Welfare Organizations are doing all they can to encourage the immunizing of children against this, and other dreaded childhood diseases.

How Anti-Toxins Are Made

The manufacture of diphtheria anti-toxin illustrates in a general way the method used in the preparation of anti-toxins. A horse is first given a light attack of diphtheria by introducing the germs of this disease into its blood. Anti-toxins soon begin to form to overcome the toxins that are produced by the growing germs. More diphtheria germs are gradually injected until the blood has developed a large amount of strong and powerful anti-toxin. At just the right time a little of the horse's blood is drawn off. This is then treated, tested, and prepared in various ways to make it useful and safe in preventing and curing the same disease in human beings. Different kinds of animals are sometimes used in the manufacture of anti-toxins for other diseases in order to get the best results.

STRONG BODY RESISTANCE PREVENTS DISEASE

Some persons seldom become ill, while others are

not so fortunate. Some can be exposed to a contagious disease and not develop it, while others "catch" it easily. Those who keep in good health through all sorts of conditions are said to have a strong, or a high, resistance to disease, while the less fortunate ones have a weak, or a low, resistance to disease.

We cannot begin too young to build up a strong body resistance.

The regular practice of health habits is one of the best methods of keeping the body resistance as strong as possible. Exercise, sunshine, and fresh air form a combination which is helpful to all parts of the

body. Proper food and the regular elimination of wastes are extremely important. Personal cleanliness is a valuable safeguard against the entrance of disease germs into the body. Rest and sleep are needed for the growth and repair of the tissues.

How Resistance to Disease Becomes Lowered

Neglect of health habits lowers resistance to disease. The neglect of even a single one of them has a harmful effect upon the others and upon the whole body as well. Worry, unhappiness, and discontent interfere with the strength of the body's defenses against disease. Such conditions often produce nervousness, make one cross and irritable, interfere with digestion, rest, and sleep, and prevent the cheerfulness so necessary to health.

Worry over becoming sick or about getting well is a great handicap both to the doctor and to the patient, and may lessen the chances of recovery.

Overwork causes a drain upon the strength and energy which usually leaves the body weak and poorly prepared to offer a strong fight against disease.

Avoid wet feet and continued exposure to cold. The rapid loss of body heat at such times often gives the germs a chance to grow, and with the body in a weakened condition they may develop faster than the natural defenses of the body can overcome them. The use of alcohol and tobacco lowers the resistance to

disease. They interfere with many of the processes of the body, and poison and often permanently injure some of the important organs.

Helpful Things to Do

1. Write an account of the method used in making milk safe. Illustrate it by pictures which show the different things that are done to keep disease germs out of it.

2. Invite a local health officer to visit the school to tell of the work that is done in preventing epidemics of contagious diseases, or of other preventive health work. Ask him to bring a catalogue or list of all the different vaccines, serums, and anti-toxins that are available. Note the large number of these.

3. Read the life of Dr. Jenner and of Dr. Pasteur who were pioneers in the discovery of vaccination and the use of anti-toxins.

4. Construct a fly trap. Make use of it, if necessary. Join actively in all fly-swatting campaigns.

Questions and Health Problems For Discussion

1. Discuss the proverb "an ounce of prevention is worth a pound of cure" as applied to the prevention of disease.

2. Describe how coughing, sneezing, and spitting spread disease germs. What precautions should be taken to reduce the dangers from these means?

3. One store keeper screens his goods from dust

and flies, and another does not. From which one would you buy food? Why?

4. Suppose an epidemic of typhoid fever should occur. What would the health officers be likely to examine first of all in their search for the source of the disease germs? Why? What other things would they be likely to do?

5. Why are some locations of wells and cisterns safer than others?

6. In a typhoid fever epidemic no cases of the disease developed in homes where all the water was boiled before it was used. How can you account for this?

7. In what places do flies breed? How can their breeding be prevented around city homes? Country homes?

8. What diseases are spread by mosquitoes?

9. Describe the life history of the mosquito.

10. How can the breeding of mosquitoes be prevented?

11. Why are rats dangerous animals?

12. How can rats be kept away from the home?

13. Describe the purpose and value of vaccination against smallpox.

14. How is diphtheria anti-toxin made?

15. What is meant by a "high resistance" to disease? By a low resistance to disease?

16. Outline a program which will help to build up a high body resistance to disease.

17. How is resistance to disease lowered?

CHAPTER XVIII

WORKING TOGETHER FOR HEALTH

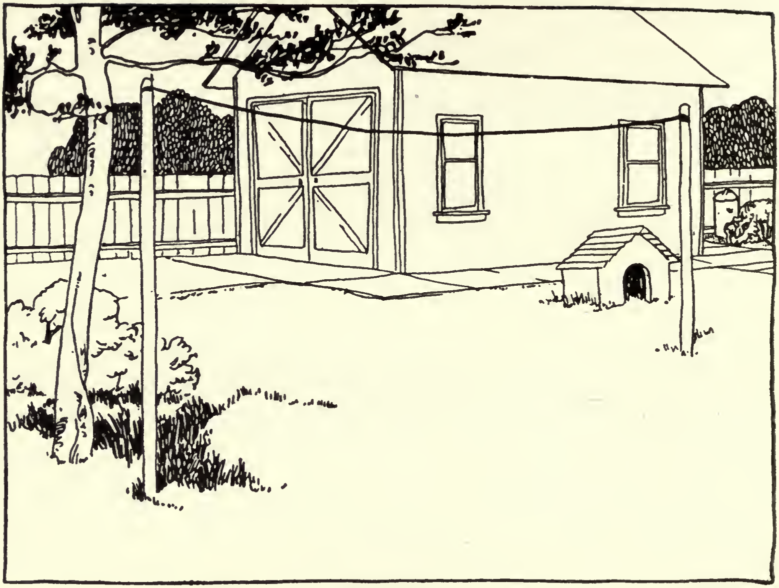
Health often depends just as much upon what others do as upon the care we take of our own bodies. We may wish to eat clean foods, but storekeepers may be careless in handling them. We may want to drink pure water, but it may be polluted by wastes from mills along the banks of the streams.

Each of us must take a part of the responsibility and do our share in promoting the health of the whole community. It is only as we all work together for health that we make our own comfort, safety, and happiness more sure and certain.

Responsibilities in Our Homes:

Clean and well-kept homes safeguard the health of all. A clean home contributes its share toward the protection of the members of the whole community. Prompt removal of dirt and rubbish, and the sanitary care and disposal of garbage and other wastes prevent the breeding of flies, mosquitoes, rats, mice, and vermin. Such pests roam about in a community and can spread destruction and annoyance over a large area. Even the well-intentioned flower pots and watering places for birds and animals will provide breeding places for mosquitoes unless they are watched closely.

In communities where the houses are close



Make Every Week a "Clean-Up" Week

together, the hours of rest and sleep may be seriously disturbed by noise and similar distractions unless each member of the community is considerate of the needs and desires of the others. Such disturbing elements should not be prolonged to the point where they interfere seriously with the rest the body needs for its growth and the repair of its tissues.

Schools Should Be Healthful and Happy Places:

Modern school buildings are built with more regard for the health of the pupils than they were

years ago. Many of the older buildings are being remodeled to admit more light and provide better ventilation than before.

In a properly built school building the rooms and corridors are well lighted. The heating and venilating systems are planned to provide just the right amount of fresh air needed by each pupil. Materials which do not gather and hold dirt so easily are used for finishing the walls of classrooms and halls. Furnishings and decorations are selected with a view to their pleasing appearance as well as to their usefulness.

In new buildings or old, however, the duties and responsibilities of the pupils and teachers and all others concerned with the school plant are about the same. The school is a real community in which all must work together for health as well as in the pursuit of knowledge.

All must help in keeping the school clean. The classrooms, toilets, corridors, playrooms, playground, all present their separate problems. Plans for caring for them must be made and carried out in order that healthful conditions will result. Form the habit of wiping the feet upon entering. Put waste paper, litter, and rubbish in the receptacles provided for the purpose.

Protect others from disease germs by placing the hand or handkerchief over the mouth and nose when coughing or sneezing. Don't spit—it spreads disease.

Observe strictly all the rules of quarantine concerning contagious diseases. Don't return to school before all danger of spreading a contagious disease has passed.

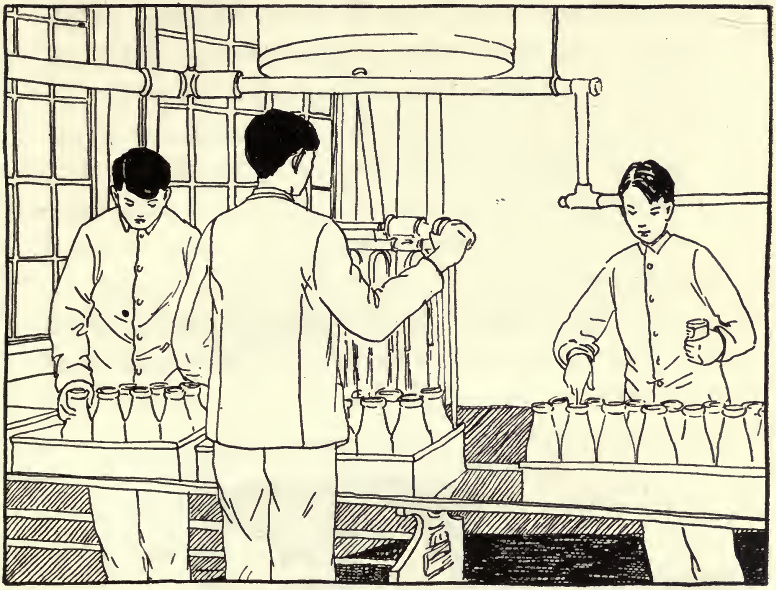
Cooperate cheerfully with the health authorities connected with the school. Attend promptly to the correction and removal of the physical defects that may be pointed out from time to time. In this way many cases of poor eyesight, decayed teeth, diseased tonsils, and other troubles which might ordinarily be overlooked, can be prevented from becoming more serious.

Do Your Part in Community Health:

Each community is actively interested in promoting the health of each of its members. Town, City, State, and Nation all cooperate and work together in preventing disease and in safeguarding the comfort, happiness, and prosperity of the people.

Each group has its Board of Health, Dairy and Food Commissioners and Inspectors, and Public Health Doctors and Nurses, who are constantly on the watch to prevent violations of the rules and regulations that are found to be necessary. They also take charge of outbreaks and epidemics of diseases which may occur, and are constantly at work to educate and encourage everyone to do his full share in the promotion of the public health.

The following are some of the ways in which the



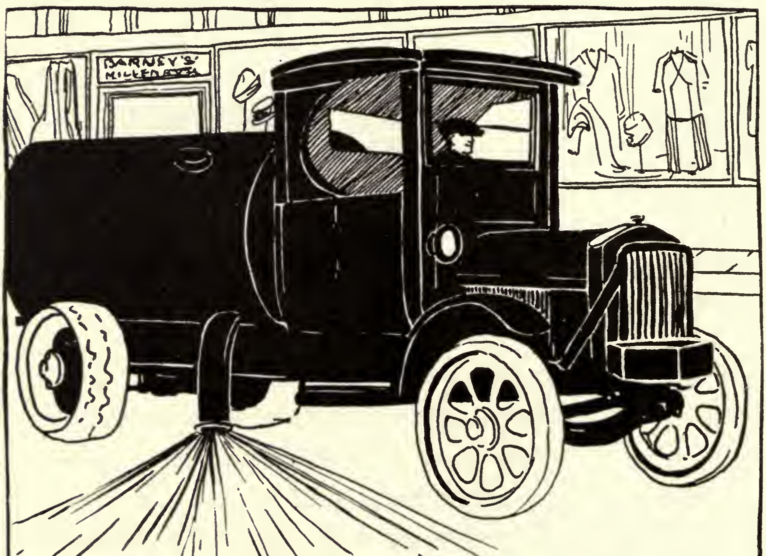
Interior of bottling room in a sanitary dairy. Food producing establishments should take every precaution to prevent the spread of disease germs.

community seeks to protect the health of its members and which need our loyal support and cooperation:

(1) *Safeguarding Our Food Supply.* Markets, dairies, bakeries, ice-cream plants, canning-factories, slaughter houses, cold-storage warehouses, and so forth, are regularly inspected to prevent unwholesome and impure foods from being manufactured and sold.

(2) *Protecting the Water Supply.* Pollution of all streams is prevented so far as possible. Filtration is provided in order to purify the drinking water. Sewage systems are built and maintained to carry off wastes. Frequent examinations of the water are made to prevent disease germs from being spread in this way.

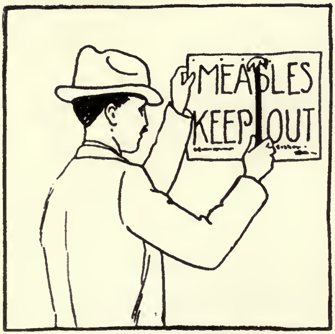
(3) *Pure Air.* Measures are taken to keep the air as pure as possible. The pouring of excessive smoke and gas into the air by fac-



This method of cleaning streets keeps down the dust. It is superior to sweeping. Why?

tories is often forbidden. The ventilation of buildings where people gather in large numbers is supervised and regulated.

(4) *Cleanliness.* Streets are cleaned, rubbish, ashes, and garbage are collected and disposed of in a way which will prevent the spread of disease from these sources.



A quarantine is established to prevent the spread of contagious diseases.

(5) *Controlling Contagious Diseases.* The Boards of Health establish quarantines in all cases of contagious disease. All persons coming in contact with a disease are required to follow certain rules and regulations which will prevent its spread. Public Health Doctors control vaccinations and encourage insect and vermin extermination.

(6) *Regulation of Sale of Alcohol, Tobacco, and Drugs.* Public Health Authorities supervise and regulate the manufacture and sale of alcohol, tobacco, and drugs.

(7) *Regulation of Working Hours and Conditions of Labor.* The hours of work and the conditions under which work is done are matters which concern the public health. Laws controlling the employment of women and children in different kinds of work are enforced. Factories are inspected and all matters connected with the hours of labor, sanitation, safety devices, lunch periods, and so on are subject to some control and regulation by the community.

(8) *Other Interests of the Community in Public Health.* Public Health Doctors and Nurses are available when needed. Ambulance services are provided. Hospitals and Asylums are maintained. Public Health Campaigns are organized and encouraged, such as "Clean Up Week", "Swat the Fly Campaigns," and so on, all of which must have our cooperation in order to be successful.

Helpful Things to Do

1. Inspect the house and yard for possible breeding places for flies, mosquitoes, and rats. Remove all such places that are found. Join heartily in making "Clean-Up Week" a success.

2. Write slogans and posters that can be used in a campaign to make the school and its surroundings a healthful and happy place.

3. Visit one or more of the following places: dairy, bakery, ice-cream plant, stores, and markets. Observe the precautions taken to keep foods clean and pure. Note any failure to take these precautions. Where should such carelessness be reported?

4. Visit a filter plant. Describe the things that are done to make water safe to use.

Health Problems and Questions For Discussion

1. What is meant by "Working Together for Health"?

2. One householder covered his rain barrel and his next door neighbor did not. Would both families or only the careless one be annoyed by mosquitoes from the open rain barrel? Why?

3. Why is the work of keeping the school and its surroundings clean the duty of all the pupils and not only a few of the more thoughtful ones?

4. What good reason is there for wiping the feet before entering the home or the school?

5. How can we help in keeping the streets clean?

6. Name and discuss the different ways in which the community seeks to protect the health of its members.

7. Why do communities have "Clean-Up Weeks", and "Anti-Fly Campaigns"?

CHAPTER XIX

WHAT YOU SHOULD KNOW ABOUT TUBERCULOSIS

Tuberculosis causes so many deaths each year that it is still one of the world's dreaded diseases. Constant battles are being waged against it by health authorities in almost every city, state, and nation.

It is encouraging to note, however, that the death rate is much lower today in many places than it was years ago. This decrease is due largely to the education of the people concerning the nature of the disease and the ways in which it can be prevented.

How Tuberculosis Gets a Start:

Tuberculosis is a germ disease. It usually attacks the lungs, but may affect the bones, joints, or other parts of the body. It may develop at any age, and it causes far too large a proportion of the deaths of children as well as of grown-ups.

The tiny bacteria which cause it come from persons or animals ill with the disease. These germs usually find their way into our bodies through the mouth and nose. They are carried in with the air we breathe, or the food we eat, or on the fingers and other things that may be put into the mouth.

The natural defenses of a healthy body are usually able to overcome the germs, killing them or rendering them harmless by walling them up in the lung

tissue. Should the germs find the body weakened by neglect, overwork, or by other diseases, they may prove too strong for the body's defenses and begin to grow and multiply.

Prevent the Spread of the Germs:

The ignorance and carelessness of people sick with tuberculosis are largely responsible for the spread of the germs which cause it.

Persons ill with tuberculosis are often forced to cough a great deal. The matter which is coughed up contains large numbers of active germs which can cause the disease in others. If this sputum (or spit) is carelessly deposited on the ground or floor, the moisture evaporates and leaves the germs free to blow around on the dust in the air, or be picked up and carried about by flies, or on shoes or on anything that comes in contact with them. Such persons should always spit in a paper cup or cloth which can be burned.

It is most important to remember that persons may have this disease in its early stages without knowing it. The sputum from such persons is quite as dangerous as at any later time. Therefore careless spitting should never be practiced by anyone. It is usually prohibited by law in all public places, and notices are posted calling attention to the dangers of the practice.

Cover the mouth in coughing and sneezing to

prevent the spread of germs through the air by these means.

Cattle are subject to tuberculosis. Milk and meat from tuberculous cattle contain the germs of this disease. In order to reduce the dangers of infection from these sources, many States order the destruction of tuberculous cattle, forbid the use of their flesh for meat, and require the Pasteurization of all milk.

All persons who come in contact with tuberculosis patients or handle anything used by them should be most careful to sterilize the hands frequently in order to prevent the spread of the germs on them.

Importance of Strong Body Resistance:

One of the best safeguards against tuberculosis is a strong body resistance. This is built up and kept strong by the regular practice of health habits. It will be found much easier to keep well than to get well.

Each of the following health practices has its place in keeping the germs of this disease from getting a start in their growth:

(1) *Eat nourishing foods.* Balance the diet with proper amounts of body-building foods, heat and energy-giving foods, and protective, or regulating, foods.

(2) *Buy and prepare only pure and clean foods.* We have a right to be supplied with

meat and milk from healthy cows. We should refuse to purchase foodstuffs of any kind that may be prepared, handled, or sold without proper regard for all sanitary precautions.

(3) *Exercise in the fresh air and sunshine as much as possible.* There are but very few days in the year when it is not possible to exercise out of doors provided the proper amount and kind of clothing is worn.

(4) *Work only in well-lighted, clean, and properly ventilated places.* Avoid dusty occupations, unless ample protective devices are

The open air schoolroom

Instead of bringing fresh air into the bedroom, why not sleep out-of-doors?

It is possible to provide an outdoor sleeping porch on almost any type of house.

used. Avoid continued overwork. Pay attention to the signs of fatigue and give the body a chance to repair its worn out tissues. Be happy and contented in your work, seeking the kinds of rest and relaxation that do not add to the strains of the working hours.

(5) *Sleep in well ventilated rooms.* Keep the windows open in the sleeping room winter

and summer. Provide extra bed coverings in cold weather rather than cut down the amount of fresh air that is admitted. Air the room during the day.

(6) *Keep the body and the surroundings clean.* Always wash the hands before eating. Keep the fingers, pencils, and other things out of the mouth. Brush the teeth just after getting up and before going to bed, and, if possible, after each meal.

(7) *Maintain an erect posture.* Stooped shoulders and cramped positions press upon the lungs, interfere with their work, and reduce their resistance to disease.

(8) *Form the habit of having a medical examination once a year.* This will discover slight troubles before they become serious.

Symptoms of Tuberculosis:

Many cases of tuberculosis can be cured if they are discovered in time and the course of treatment faithfully followed.

An early discovery of the disease in the body is most important. As a usual thing, there is no pain or discomfort at the very beginning, and the characteristic cough does not develop until it has gained a foothold.

There are a few symptoms, however, which should cause one to seek expert medical advice regarding

the presence of this disease. The doctor's examination will determine whether tuberculosis or some other bodily disturbance is the cause of the symptoms.

The following are some of the symptoms which accompany the development of tuberculosis:

(1) *Headache, nausea, and loss of appetite.*

(2) *Loss of weight and stopping of growth.*

(3) *Feeling tired more often and more easily than usual.*

(4) *Night sweats, with fever.*

(5) *Prolonged, chronic cough.*

The Cure of Tuberculosis:

Tuberculosis cannot be cured by drugs and medicines. The cure consists in helping the body in all possible ways, following the program laid down by the doctor rigidly and faithfully. The struggle against the disease is a long one, and too often the treatment is not kept up long enough to prevent the disease from getting a fresh start from time to time.

Rest is one of the first requirements of the cure. Every bit of strength must go toward the overcoming of the germs. In this disease it is easy to lose all that has been gained by a return to an active life too soon.

Sunlight and fresh air help so much that persons ill with tuberculosis or even threatened with it should work and live, as much as possible, and even sleep,

out of doors. Specially constructed porches and sleeping-rooms are often provided for this purpose.

Proper food helps to give the body the strength it needs to carry on its fight against the germs. Plenty of good, wholesome, nourishing food of all kinds is needed.

Persons who develop tuberculosis greatly increase their chances of getting well if they do not become too scared, and worry and fear that their case is hopeless. A strong resolution and determination to make a hard fight against it will go a long way toward helping the body in its efforts to check the spread of the disease.

Helpful Things to Do

1. Look up the records of deaths from tuberculosis in your community for a number of years. Are they increasing or decreasing? Compare them with the records for other communities. Can you account for any of the differences you find?

2. Plan a series of posters to illustrate each of the health practices that fortify the body against tuberculosis.

3. Design and construct an individual drinking cup. The public drinking cup is a frequent means by which the germs of tuberculosis are spread.

4. Make a plan to show how a sleeping porch could be adapted or added to your home.

Health Problems and Questions For Discussion

1. What is the cause of tuberculosis?

2. Name three things that lower the body resistance against tuberculosis.

3. How are the germs of tuberculosis spread?

4. Discuss four or five things that are valuable in preventing tuberculosis. Add to these if you can think of others.

5. Name a few of the symptoms of tuberculosis.

6. Who has the better chance of recovery, a person who begins the cure just as the disease starts or one who waits until later?

7. What three things are necessary to the cure of tuberculosis? Discuss the importance of each.

CHAPTER XX
AIR AND BREATHING

Air is one of the great necessities of life. In times of famine, people may live for weeks without food, but no one can live without air for longer than a few minutes at a time.

We live at the bottom of a great "sea" of air which covers the earth and extends for several miles above it. There is so much air all about us that we usually think very little about it so long as nothing interferes with our supply.

Breathing, or Respiration:

Breathing, or *respiration,* as it is also called, is the means by which the body is supplied with air. It is a simple mechanical process controlled by the action of certain muscles of the chest and abdomen. It can be studied by actual observation and experiment more easily than other bodily processes like digestion or circulation.

Watch a person breathing quietly. Notice the slow, steady rise and fall of the chest and the movements of the abdomen as the air passes in and out of the body. Rest the hands upon the chest and you will feel them actually lifted up and lowered again. Then if you place the hands upon the front of the abdomen over the region of the stomach you will feel this part of the body expand slightly as the air is

breathed in, returning to its natural position again as the air is breathed out.

This shows that breathing or respiration consists of two parts, a breathing in and a breathing out. The first part, or the breathing in, is often called *inspiration,* or *inhaling,* while the breathing out is known as *expiration,* or *exhaling.*

How We Inhale:

In order to make room for the air that the body needs, the chest cavity grows larger at each inspiration. Then as the chest enlarges the air rushes in to fill up the extra space, in much the same way that air flows into a blacksmith's bellows as he opens it.

In correct breathing, the chest cavity enlarges in two directions at the same time, outwards and downwards. The outward expansion of the chest is done by the work of the intercostal muscles which are placed between the ribs. As these muscles contract, they lift the ribs and breast bone up and actually make the chest larger than before. The amount of this expansion can be measured by the use of an ordinary dressmaker's tape. First measure the distance around the chest with as much air breathed out as possible. Then breathe in all the air that can be forced into the lungs and take a second measurement. The difference between the two records will be the number of inches that the chest has expanded

in this direction to make room for the air that has entered the body.

The downward enlargement of the chest cavity is caused by the action of a broad, flat muscle called the *diaphragm*. The diaphragm forms the floor of the chest, and separates this part of the trunk from the abdomen. In its natural position this muscle closely resembles an inverted saucer, with the rounded part extending upwards into the chest and the hollow side facing downwards. At the same time the intercostal muscles lift the ribs up, the diaphragm contracts or flattens out, enlarging the chest cavity in a downward direction. The pressure of the diaphragm upon the organs in the abdomen also causes this region to expand slightly to make room for them.

How We Exhale:

After each inspiration the intercostal muscles relax and lower the ribs. The diaphragm returns to its hollow shape again and pushes up into the chest cavity. These two actions decrease the size of the chest and force the air out of the body, thus completing the process we call expiration.

Deep and Shallow Breathing:

Breathing is one of those bodily processes which goes on day and night without needing direction and control from us. We cannot command it to stop for more than a few moments at a time even if we

should wish to do such a foolish thing, and yet we do have it within our power to strengthen or neglect the muscles which do the mechanical part of the work.

In deep breathing, the ribs are fully lifted up and the diaphragm is contracted to its utmost. This exercises and strengthens the muscles connected with the breathing process and admits a plentiful supply of air to the body.

Shallow breathing is lazy breathing. The ribs are only partially lifted up and the use of the diaphragm is largely neglected. As a result, the muscles fail to develop properly, and the lack of fresh air in the deeper parts of the lungs often opens up the way for the germs of tuberculosis to get a start.

Make Correct Breathing a Habit:

In correct breathing, the chest cavity enlarges both outwards and downwards. The diaphragm is required to add its share to the work of the ribs in making room for the air the body needs.

Like all muscles, those which act in breathing can be strengthened and trained by proper use. Deep breathing exercises taken night and morning before an open window are valuable for these purposes, but vigorous play, games, and sports out-of-doors are better than anything else. During active, vigorous play, the whole body calls for an extra supply of air, and the breathing immediately becomes deeper to

meet the needs. At such times deep breathing is a natural process and is not forced as it is during the more artificial breathing exercises which do not call the whole body into action.

Tight Clothing Interferes With Breathing:

Tight waistbands, belts, corsets, and other articles of clothing which press tightly upon the chest or abdomen interfere with natural breathing. They handicap the growth and development of the muscles used in this process, and diminish the supply of fresh air that enters the lungs.

Posture Affects the Breathing:

All incorrect positions of the body which cramp or press upon the chest or abdomen interfere with natural breathing. Stooped shoulders prevent the chest from expanding properly. Sliding down in the seat at school or elsewhere cramps the chest and abdomen, causes stooped shoulders, and leads to shallow breathing. It will be well frequently to check up your own sitting, standing, and walking positions with the suggestions regarding these activities given on pages 90-93, in Chapter VII.

The Use the Body Makes of Air:

In an earlier comparison of our body with a steam engine, it was pointed out that both get their heat and energy from the combustion, or burning up of their

fuel. All combustion, or burning, requires the presence of *oxygen,* one of the gases of which the air is composed.

The supply of oxygen, or air, is admitted to the engine through doors or other openings provided for the purpose. The amount that enters can be regulated so that when the drafts are open, more oxygen reaches the fire and it burns up faster; when the drafts are closed, less oxygen is admitted and the fire burns more slowly. The oxygen the body needs is supplied by the process of respiration, or breathing. When extra oxygen is needed, as it is during vigorous exercising, our breathing becomes deeper and more rapid; then during rest periods, when the demand is lessened, the breathing returns to its slower, more normal rate of about 18 to 20 inspirations and expirations per minute.

As the oxygen is used up, a waste gas called *carbon dioxide* is formed. This is carried out of the engine through its smoke stack or chimney while it is eliminated from the body at each expiration.

Thus, respiration is a process which supplies the body with oxygen and at the same time attends to the elimination of the wastes that are formed as the oxygen is used up. The parts of the body especially adapted to carry on these processes are the lungs and the air passages.

IMPORTANCE OF LUNGS IN RESPIRATION

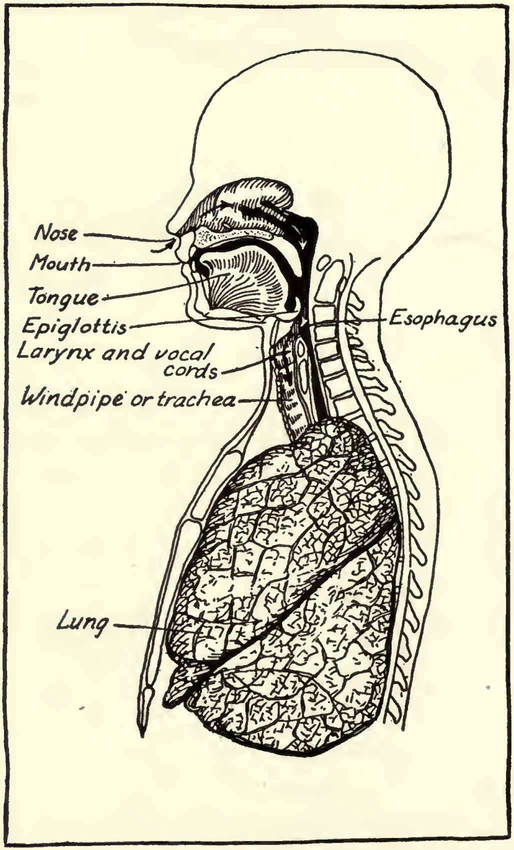
The largest part of the chest cavity is filled up by the *lungs.* The lungs are the principal organs of respiration, for it is in them that the red corpuscles take up their precious burden of oxygen from the fresh, inspired air. Here also these same corpuscles give up the waste carbon dioxide they have collected from the tissues.

How the Air Reaches the Lungs:

The air we breathe enters the body through the nose and mouth. It then passes on through an opening in the back part of the throat into the *windpipe,* or *trachea.* Our windpipe branches into two parts as it approaches the lungs. One *bronchial tube,* as these branches are called, goes to the right lung and the other one to the left lung. Within the lungs, each bronchial tube then continues to divide and branch again and again until the whole arrangement resembles an inverted tree.

The Vocal Cords. An enlargement in the upper part of the windpipe, known as the larynx, contains the *vocal cords.* These cords are arranged so that they can be vibrated, or set in motion, by the force of the air as it passes over them, producing the sounds we call the voice. The position of the larynx is marked by the prominence in the upper part of the neck that is sometimes known as the "Adam's

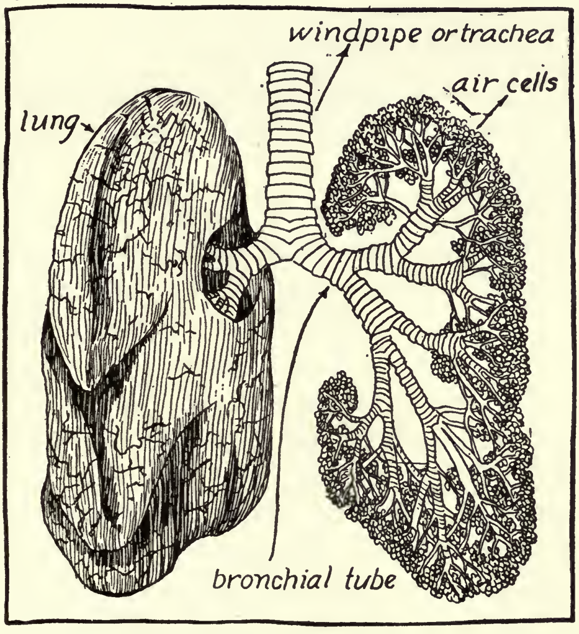
Apple." This enlargement is nothing more than an extension of the rings of cartilage that form the walls of the windpipe at this point.



How the air reaches the lungs

Structure of the Lungs:

The lungs are extremely light and elastic. Those of animals, which can be seen in the butcher shops, are so light that they will float very easily upon water.



Structure of the lungs

The air enters each lung through a branch of the windpipe, called a bronchial tube. Each hollow bronchial tube divides into smaller ones which continue to branch again and again until the whole

arrangement within each lung resembles the branching of an inverted tree.

Each little tube finally ends in a cluster of tiny *air sacs,* or *air cells.* These act as reservoirs to hold the air while the exchange between the oxygen and the carbon dioxide takes place.

A net work of tiny capillaries runs in all directions in the walls of the air cells. This allows a large quantity of blood to be spread out in the lungs and brings the red corpuscles very close to the oxygen.

Blood Is Purified in the Air Cells:

The real work of respiration takes place in the tiny air cells of the lungs. It is here that the red corpuscles give up their carbon dioxide and take the oxygen from the air in exchange. It is interesting to note that the blood and the air do not come into actual contact in this exchange. As the blood enters the lungs it spreads out into the tiny capillaries which are found in the walls of the air cells. The walls of both the air cells and the capillaries are so thin and delicate that the oxygen readily passes through them from the air cells into the blood stream, while the waste carbon dioxide passes just as easily through them from the blood stream out into the air cells. The oxygen is then taken up by the red corpuscles in the blood while the waste carbon dioxide is forced out of the air cells by the process of expiration.

Exercise and Correct Breathing Habits Keep All the Air Cells Active:

In ordinary breathing only about one-tenth of all the air in the lungs is sent out of the body at each expiration. In forced expirations as much as one-

Vigorous exercise strengthens the lungs. One of its best forms is happy play.

half can be expelled, leaving always about an equal amount confined in the deeper and more remote air cells. As breathing continues fresh air gradually works its way down to these cells and replaces the stale air.

Correct breathing habits which require the movements of both the chest and abdomen help to keep all the air cells active.

Vigorous games, and many different forms of muscular work develop and strengthen the lungs. Slow running, brisk walking, swimming, and similar forms of exercise create a demand in the tissues for a greater amount of oxygen. The breathing becomes deeper and more rapid to supply the extra amount. The air penetrates deeper into the air cells of the lungs and increases their power.

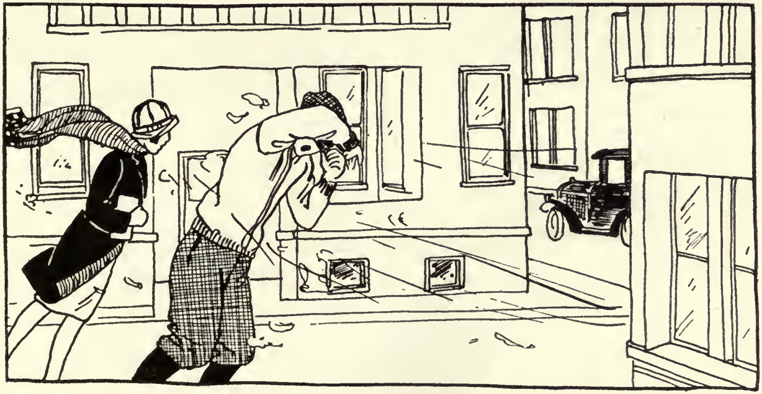
Active, healthy air cells can resist attacks of the germs of pneumonia and tuberculosis much more successfully than cells which have become weakened through idleness or have been injured in other ways.

Dust Is Injurious to the Lungs:

The first and most serious charge against dust is that it is a carrier of disease germs. The germs of respiratory diseases like colds, pneumonia, and tuberculosis enter the air passages and the lungs on the dust that is in the air we breathe. Some of this dust is removed from the air before it reaches the lungs by the tiny hairs in the nostrils and by the moist, sticky lining of the nose and throat. But in spite of these natural protections we should do all we can to keep down the amount of dust in the air.

A second dangerous count against dust results from the actual injury to the cells of the lungs by the

hard, sharp particles that help to compose it. Such injuries weaken the powers of these cells to fight against the attacks of the germs carried into them by the dust particles themselves and often lead to tuberculosis. This sharp, cutting dust is often formed in certain occupations like the grinding of



Breathe through the nose to keep dust out of the lungs.

metals and stone, and it requires extra care to prevent serious injury to the lungs. The constant breathing of the dust in flour mills, saw mills, and other places where things are handled in a finely powdered form is equally dangerous. Many states protect workers in such occupations by requiring the use of dust collectors and removers and even masks for the workers themselves.

Sweeping and dusting should be done in ways that prevent the spread of dust. The vacuum cleaner is best for sweeping, and damp cloths are proper for

Disease germs are spread by dust. Prevent this by using a vacuum cleaner.

dusting. Dry dusting is unsanitary because it often spreads the dust and germs over a wider area than before. When a vacuum cleaner is not obtainable,

the place to be swept should first be sprinkled with water or even with damp sawdust in order to keep down the dust.

MANY COLDS ARE PREVENTABLE

A cold is a disease caused by germs which have found favorable conditions for growth somewhere in the air passages of our body. Colds are most likely to develop when the body resistance is weakened through improper nourishment, lack of sufficient rest, wet feet and the consequent chilling of the body, or the growth of adenoids. As the germs grow, they cause inflammation and swelling of the blood vessels and tissues in these air passages. If the inflammation affects the nose or head only, we call it a "cold in the head", farther down in the air passages, it develops into "bronchitis", while in the lungs themselves, the germs cause pneumonia.

Prevention of colds begins with the strengthening of the body resistance. This is done by building up the general health. Rest and sleep in well ventilated places. Exercise out of doors as much as possible and avoid bundling up the neck and face with furs and too much clothing. These parts of the body need to be gradually accustomed to rapid changes between the warm interiors of our houses and the cold outdoor air of the winter months.

Colds are mildly contagious. Therefore it is best to avoid needless contact with persons who are

suffering from them. Avoid overcrowded and poorly ventilated places for the same reasons.

OUTDOOR AND INDOOR AIR

We exercise out of doors because of the freshness and greater purity of the air.

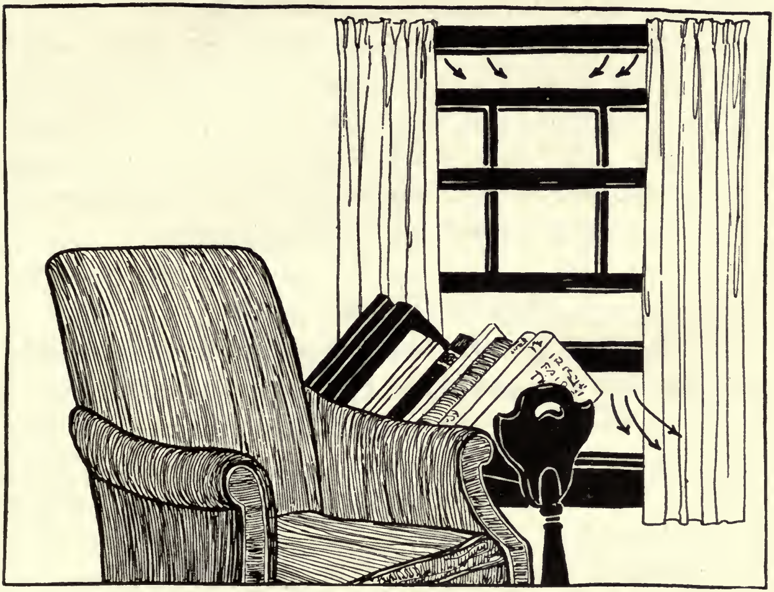
Indoor air usually becomes changed in certain ways. It loses some of its oxygen and gets the waste carbon dioxide in exchange. It becomes warmer from contact with our bodies and absorbs the moisture that is breathed out with the expired air from the lungs.

These changes in indoor air have undesirable effects upon our bodies. People who breathe the same air over and over again in a room soon begin to grow restless; attention easily wanders and actual feelings of discomfort and uneasiness are felt. These result chiefly from the fact that the air becomes too warm and too moist and interferes with the control of our bodily heat and other important processes.

Ventilation Relieves These Conditions:

Ventilation is the means by which indoor air is kept fresh and better suited to our use. The usual methods of ventilating provide a new supply of fresh air from out of doors. This is best accomplished by opening windows at both the top and bottom. The cooler outside air comes in at the bottom and the stale, warmer air goes out at the top. As a result,

the supply of oxygen is replenished, the air is cooled, and the amount of moisture lessened, all of which have a beneficial effect upon our bodies.



Proper window ventilation calls for two openings for the air. The pure, cooler air comes in at the bottom while the impure, warmer air goes out the top.

In schools, factories, theaters, and other places where large numbers of people collect, the fresh air is often circulated by large fans, or blowers. It is often passed through screens to remove the dust before it is forced around.

Overheating of rooms is injurious to health. It dries the moisture from the air passages and reduces resistance to disease germs which find their way into these places. It tends to lessen our vigor and vitality. The laziness and indifference which so often come from being in overheated rooms is in great contrast to the vigor and energy we have when the air is cool and crisp. We should try to keep our living rooms at a temperature of about 70 degrees Fahrenheit in order to prevent these undesirable results.

Helpful Things to Do

1. Watch a person breathing quietly. Note the slow, steady rise and fall of the chest and the movements of the abdomen. Place the hands upon the chest and abdomen. Describe the movements that occur at each inspiration and expiration. What causes them?

2. Observe the action of a blacksmith's bellows or other similar machine. In what ways does it compare with the mechanical movements of respiration?

3. Measure your chest expansion with a tape line. How does the record compare with that of your friends?

4. Try this experiment. Place a lighted candle in a jar and close the lid down tightly. Why is the flame soon extinguished? Light it again and remove the lid just before it goes out. Why does the flame burn up brightly again as the lid is removed?

5. Make a list of suitable games and exercises which can be played out of doors in each season to strengthen and develop the lungs.

6. Plan and carry out an exhibition, or demonstration, of proper hygienic cleaning and dusting.

7. Construct a window-board which will allow fresh air to enter a room but will keep out rain and snow.

Questions and Health Problems For Discussion

1. Name some other great necessities of life besides air.

2. What is meant by "breathing" or "respiration"?

3. What is inspiration? What is expiration? How is each accomplished in the body?

4. Why is it important that the chest enlarge in two directions at each inspiration?

5. Explain why shallow breathing is "lazy breathing".

6. Why are games and athletics out of doors better than mere deep breathing exercises in developing habits of correct breathing?

7. Observe persons who do not breathe correctly and determine how much tight clothing and improper posture have to do with these bad habits.

8. What use does the body make of the oxygen in the air?

9. A man forgot he had opened the drafts of his furnace, and shortly afterward the fire had burned out. Why did this happen? How does over exercise correspond to this in the case of our bodies?

10. What are the lungs? Describe their structure.

11. How does the air reach the lungs?

12. What is the important work of the air cells?

13. In what ways does exercise benefit the air cells of the lungs?

14. Describe two ways in which dust is injurious to the lungs.

15. What are the proper methods of sweeping and dusting?

16. How can many colds be prevented?

17. What is meant by ventilation? Why is it necessary? How is it best accomplished in a bedroom or other rooms in our home?

CHAPTER XXI

GETTING RID OF BODY WASTES

You may recall from Book I that we must keep our bodies clean inside as well as outside. Just as it is necessary to clean the ashes out of a stove at regular times in order to keep a steady fire, so must our bodily wastes, or "ashes", be removed to protect our health.

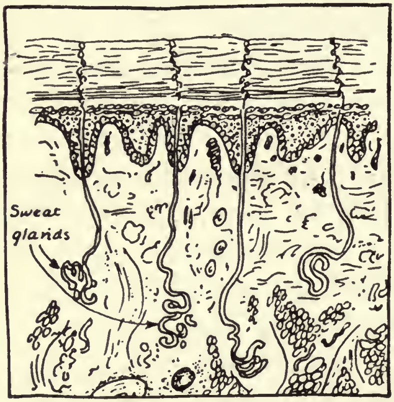
This work is so important and there are so many different kinds of wastes to be removed, that the work is divided up among a number of organs of excretion, as they are often called. Of these organs, the *kidneys* and the *large intestine* are chiefly occupied with the work of elimination, while others, like the *skin* and *lungs,* have additional duties to perform.

Where the Wastes Come From:

Whenever we think, or move our muscles, digest our food, or use up food materials and oxygen for the growth and repair of the tissues, or for production of heat and energy, some waste materials are formed.

No part of the body is responsible for them all. They form wherever some life process is carried on, whether it be within the tissue of the brain or in the farthest extremity where a muscle is doing its share in the support or movement of our body.

The Skin Assists in the Elimination of Body Wastes: The skin, you will remember, has several duties to perform. It covers and protects the body, assists in the regulation of bodily heat, takes part in the senses of touch and temperature, and helps in the elimination of some of the body wastes.



Cross-section of skin showing sweat glands.

The Sweat Glands do important work in removing waste materials from the body.

The sweat glands extend down into the inner layer of the skin and lie coiled up right among the tiny capillaries located there. As the blood passes through these little capillaries, some water, mineral salts, and organic wastes are removed and pass out as sweat, or perspiration.

Perspiration is being eliminated from the body all the time. As a usual thing, it disappears or evaporates before it can form into drops. Now and then, in hot weather and when we play or work very hard, the water collects in drops, because it is excreted faster than it can evaporate.

This elimination of waste materials by the skin is important, for as much as two to three pints of perspiration pass out through it each day. We should do all we can to aid the skin in this part of its work. Keep the pores clean so that the perspiration can easily pass out through them. Bathe the whole body with soap and warm water more than once a week. Remember also that a clean body deserves clean underclothing. Drink water freely to replace that which passes out in this way.

The Lungs as an Organ of Excretion:

In studying the process of respiration, the exchange between oxygen and carbon dioxide in the lungs was pointed out. Carbon dioxide is a waste product of combustion, and is formed whenever oxygen is used up. It is collected from the tissues by the corpuscles of the blood, and is passed out into the air cells of the lungs in exchange for the oxygen which the body needs.

In ordinary breathing, only a small part of the air is sent out of the lungs at each expiration, and even in forced expiration only about one-half the air can be expelled. This means that there is always a considerable amount of impure air in the lungs. As breathing continues, fresh air gradually works its way down to the deeper cells in the lungs and replaces the impure air. Vigorous exercise speeds up this changing of air in the air cells and helps the

lungs to eliminate their share of the body wastes. Good breathing habits which allow the fullest expansion of the lungs will also help.

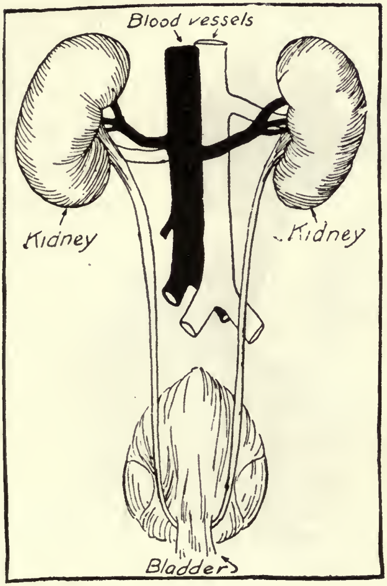
Expired air also contains some water vapor and organic wastes as well. These cause indoor air to become impure when it is breathed over and over again. The water vapor makes the air too moist. The organic wastes cause the characteristic odors of stale air. As a result, people soon begin to feel uncomfortable, grow restless, and find it harder and harder to pay attention unless the air is changed. This is easily done by opening a window at the top and bottom. The pure fresh air from out of doors comes in at the bottom while the warm, stale, impure air goes out the top.

The Importance of the Kidneys:

The kidneys concern themselves chiefly with the work of excretion, or elimination of body wastes. We have two kidneys located in the back portion of the abdomen. They are bean-shaped organs about the size of the palm of the hand.

The kidneys are well supplied with blood-vessels. As the blood passes through the kidneys, waste materials are removed, collected in the bladder, and passed out in the urine. The wastes that the kidneys remove from the blood become deadly poisons if not promptly eliminated.

It is helpful to the kidneys to drink plenty of water. We should drink at least four glasses a day in addition to that taken in our foods. Drink a glass of water when you get up in the morning. Drink other glasses between meals and also with the meals



The kidneys are located in the abdomen. The wastes they remove become deadly poisons if not promptly eliminated from the body.

if you are careful to drink it between mouthfuls and not use it to "wash the food down."

The Work of the Large Intestine in Excretion:

All undigested and indigestible parts of our foods pass on from the small intestine into the large intestine. This part of the alimentary canal acts as a storage for these waste materials until they are

eliminated from the body in the regular movements of the bowels.

The failure to eliminate these wastes results in *constipation.* This is a really dangerous disease be-

Drink Lots of Water

cause the waste matters decompose and form poisons which affect the health.

Coarse foods are valuable in preventing constipation. The indigestible parts of vegetables like spinach, cabbage, celery, cauliflower, rhubarb, let-

tuce, and of fruits, and the edible skins of some of them serve as a stimulant to the muscles in the large intestine and aid them in their action. Drinking plenty of water is also helpful. A glass of water taken just after getting up in the morning is especially beneficial. Exercise is also important. Play, games, and other forms of exercise aid in the elimination of these wastes and serve as a tonic for the whole body as well.

Remember also that habit plays an important part. Regularity in bowel movements can be established by attending to these needs of the body at regular times, such as each morning, after meals, or before going to bed. It does not pay to become careless and lazy in such matters.

Helpful Things to Do

1. Notice what happens to a fire when the ashes are not removed. How may this illustration serve to show the importance of removing the body wastes?

2. Plan and work out a series of posters which will emphasize the ways in which we can help all the organs of the body concerned with "Internal Cleanliness." Emphasize especially:

The Skin and Personal Cleanliness
The Lungs and Exercise
The Kidneys and the Drinking of Water
The Large Intestine and Proper Diet

3. Prepare a list of coarse, or bulky, foods, and fruits and fruit juices which will assist the large

intestine in its work of elimination. Which of these are included in your own diet?

Health Problems and Questions For Discussion

1. What is meant by "Internal Cleanliness"?

2. Where do the body wastes come from?

3. What important duties does the skin perform? Which one of them is connected with the elimination of waste?

4. Why does perspiration show at certain times while it does not at others?

5. How can we help the skin in its work?

6. What body wastes are excreted by the lungs?

7. How does exercise benefit the lungs in this work?

8. Why is ventilation necessary?

9. An audience in a hall grew restless. Why was the opening of the windows followed by a return to an attentive condition again? Why does a person coming in from the outside notice odors in a closed room that are not noticed by those in the room?

10. What are the kidneys? How can we help them in their work?

11. What is meant by constipation? How can it be prevented?

CHAPTER XXII

THE NERVOUS SYSTEM

All bodily movements result from the action of our muscles. Some of these movements are quite simple while others require the careful working together of whole sets of muscles.

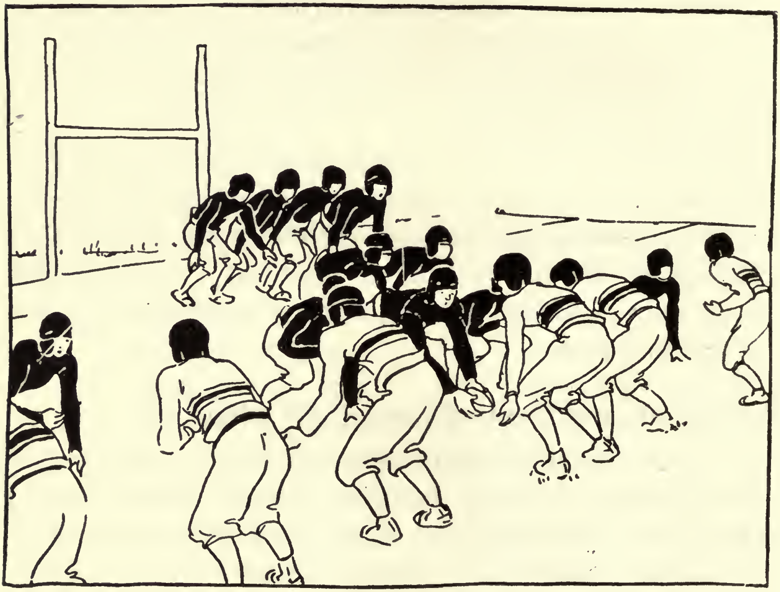
We know from experience that we can train our muscles to obey our commands and that the better they are trained the greater is their value to us. This ability of the muscles to do the right thing at the right time is due to their direction and control by the nervous system.

Direction and Control Found All About Us:

Direction and control play an important part in the success of many familiar things in the world about us. Factories and offices are under the direction and control of superintendents and general managers; armies obey the officers who command them; athletic teams develop their greatest strength under the leadership of skillful captains and coaches who keep the players working together.

In order to obtain the best results, the factory, army, or team must provide for some means of communication between the ones who are responsible for the direction and control and those who are being directed and controlled. The superintendent, or

general manager, of the factory, for example, constantly receives reports from all departments. These reports tell of the progress of the work and guide him in drawing up his plans and issuing the necessary



Their direction and control result from long and earnest practice.

orders and directions. The commanding officers of an army have many different means of communication which keep them in touch with all that is going on. They likewise base their commands upon the information they receive through these sources. The captain and coach of a team make use of appropriate

signals to direct and control the efforts of the players.

The Nervous System. The brain and spinal cord form the central nervous system. The nerves branch out from it to all parts of the body.

Thus it becomes clear that at least two of the necessary parts of any plan for direction and control are, first, a central responsible and controlling unit, and, second, a system of communication which reaches out and connects all the parts together.

Similar Organization of the Nervous System:

The nervous system is made up of three principal parts, the *brain,* the *spinal cord,* and the *nerves.* These three parts work together in a way that closely resembles the system of control used in the factory, army, or the team. The brain and spinal cord together form the central nervous system and are responsible for the work of direction and control. The nerves form the paths of communication by which the central nervous system is kept informed of all that is going on, and over which the necessary directions and commands are carried to the muscles.

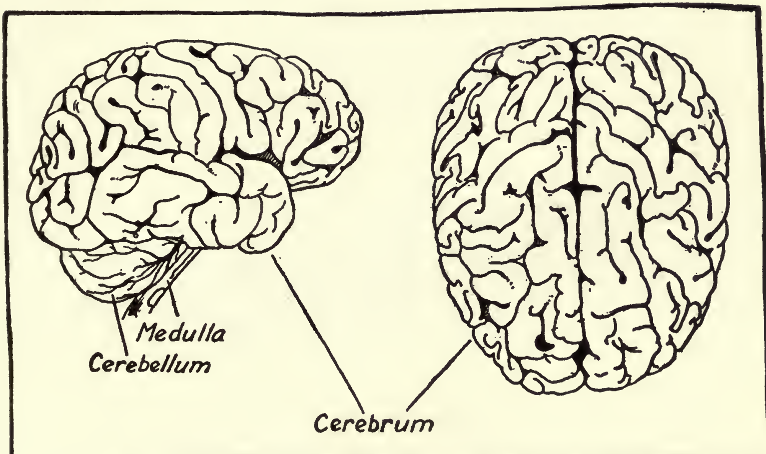
The Brain:

The brain is the principal center for the direction and control of the body and is the seat of the mind as well. It is located within the skull, the bones of which surround it and protect it from injury. It is composed of soft, spongy material and weighs from about two and one-half to three pounds.

In its general arrangement, the brain is divided into two halves, or hemispheres, connected by a little "bridge" of tissue. Its outside surface is broken up

into ridges, or furrows, which run in many directions. These *convolutions,* as they are called, give the surface of the brain a very irregular appearance.

Parts of the Brain. The brain has three rather separate and distinct divisions, called the *cerebrum, cerebellum,* and the *medulla.*



The drawing on the left shows a side view of human brain. Top view is shown at the right. Note the folded appearance.

The *cerebrum* is the largest of these divisions. It is the center of control for the voluntary movements of the body and is the seat of the mind, or thinking powers of the body. The *cerebellum* assists in the control of the muscles of the body. When this part is injured, the muscles are no longer able to work together in their accustomed ways. The *medulla* is the

smallest division of the brain and an extremely important one. In it are found the nerve centers which control the action of the heart, lungs, and other vital organs of the body. Injury or destruction of the medulla is followed by instant death because of the interference with the work of the heart and lungs.

Division of Work in the Brain. It is interesting to note that the work of the brain is divided up among a number of different *areas.* Each area does its own particular work. The front part of the brain, for example, is concerned chiefly with thinking. A small area in the back part of the brain is responsible for our sense of sight. Injury to this area destroys the sense of sight just as completely as would the loss of the eyes themselves or the cutting of the optic nerve.

Other areas in various parts of the brain direct the work of the muscles, control the speech, and make possible the senses of hearing, smell, taste, and touch. This division of work in the brain reminds us very much of the plan used in factories and mills where each worker or group of workers does only the particular part of the work assigned to it.

The Spinal Cord:

The spinal cord is a silvery white cord of nerve tissue about the size of the little finger. It extends downward from the brain through the hollow center

of the backbone, or spine, the bones of which protect it from injury.

It is made up chiefly of nerves which connect the brain with other parts of the body. Then, in addition to this use as a "trunk line" of nerves, it has charge of the direction and control of certain muscles of the body. For this reason it is included along with the brain as a part of the central nervous system.

The Nerves:

The nerves are thin, glistening white, thread-like bodies of nerve tissue. They carry messages of information in to the brain and transmit the commands of the brain back to the muscles. These two activities make use of two sets of nerves, named *sensory nerves* and *motor nerves* according to the duty they perform.

It is interesting to note that forty-three pairs of nerves serve the entire body by dividing and branching until all parts are supplied with the nerves they need. Of these, twelve pairs branch directly from the brain and are called the *cranial* nerves. Some of these are sensory, some are motor, and some are both sensory and motor. They supply the eyes, ears, nose, throat, face, and some of the internal organs. The thirty-one remaining pairs branch off from the spinal cord at various places along its length and are called the *spinal* nerves. Each pair consists of both

sensory and motor nerves which extend to all parts of the body.

Sensory Nerves. The sensory nerves carry messages to the central nervous system. It is over the sensory nerves that the messages travel which tell us whether a thing is hot or cold, rough or smooth. Messages passing over other sensory nerves result in our sight, hearing, taste, smell, and a host of other "sensations" which keep us informed of happenings both outside and inside our bodies. In some way the sensory nerve endings respond to the appropriate stimulus, and the message is carried to the proper area of the brain where it is received and understood.

Motor Nerves. The motor nerves carry the commands of the central nervous system back to the muscles, and cause them to move. It is over the motor nerves that the messages travel to the muscles which enable us to walk, run, pick up things, draw our hand away from a hot object, or so on through the countless number of movements that are possible for us to make.

It must be kept in mind that muscles cannot act of their own accord. They must always receive some impulse, or stimulus, by way of the motor nerves before they can move.

Voluntary and Involuntary Action:

Voluntary action, it will be remembered from the study of the muscles, is under the direction and con-

trol of the will, while involuntary, or reflex, action is not.

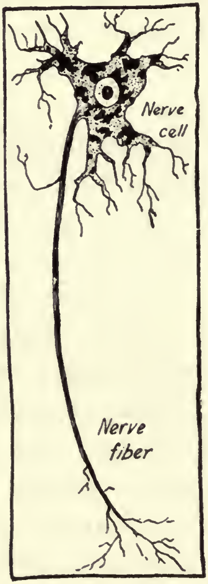
Voluntary movements like those which enter into the act of opening or closing of a door, or the hanging of a picture require some of our conscious thought and effort. These, and all other voluntary actions, use the higher, or thinking, centers of the brain in interpreting the messages brought by the sensory nerves and in sending back the impulses to action over the motor nerves.

Involuntary, or reflex, actions, like the beating of the heart, or the closing of the eyelids upon the sudden approach of an object towards the eye, or the movements that can take place during sleep, are not under our control. They are given over to lower centers of the brain which receive the messages of the sensory nerves and issue the necessary commands to the muscles. A number of reflex actions, like the rapid drawing of the hand away from a hot object, may not even call upon the brain for their direction and control, but use nerve centers in the spinal cord for these purposes. This power to control certain reflex actions causes the spinal cord to be included along with the brain as a part of the central nervous system.

Nerve Cells and Fibers:

Under a microscope, nerve tissue is seen to be made up of a mass of living cells, each composed of a

tiny central body with thin, thread-like fibers branching from it. A nerve thus appears as a bundle of these thin, thread-like fibers of nerve tissue. One end of the fibers is in the central nervous system and the other in the part of the body the nerve supplies. The sensory fibers of the nerve of sight, for example,



have one end in the brain and the other in the retina of the eye. The motor fibers connected with the eye have one end in the motor area of the brain and the other in the muscles which move the eye-ball.

The brain, itself, is really a mass of cell bodies with countless millions of tiny nerve fibers running

in all directions and with large numbers of connections between them.

The Work of Nerve Cells:

Just as the nervous system is really the total mass of the nerve cells which compose it, so the work of the nervous system is the work of these same cells. Each cell lives its own individual life and performs its own work and combines with countless other cells in carrying on our life of thinking, feeling, and acting.

In some mysterious way the nerve cells within the various areas of the brain receive and interpret the happenings in the world about us. Many such experiences, like the facts of the multiplication table or the appearance of the face of a friend, become so fixed by the work of these cells that they can be recalled, or remembered, when they are needed.

Habits, acts of skill, and, in fact, all learning, result from training and developing nerve cells to act in the proper ways.

Nerve cells also stimulate muscles into action. I recall a laboratory experiment in which an electric shock or a drop of acid was used as a stimulus to contract the muscles in the leg of a frog. In living muscle, the stimulus comes from the nerve cells. In some unknown way these cells supply the nerve force or impulse which goes out over nerve fibers to the muscles and causes them to contract.

The Economy of Habits:

Habits are sometimes called acquired reflexes. They are reflexes because they are directed and controlled by lower centers of the brain and do not require our constant thought and attention. They are acquired because they do not exist at birth and must be developed and "acquired" through our own efforts.

Habits of action, like walking, talking, and dressing begin as slow, painstaking, thoughtful movements. Then little by little the nerve cells become accustomed to their work until the actions appear to "do themselves" whenever the proper stimulus is received.

As habits develop and less thought and attention need to be given to them, the nerve cells in the lower centers of the brain take over their direction and control. This relieves the higher, or thinking, centers of this responsibility and leaves them free to care for the other important matters that need our careful thought and attention.

Health Habits:

Health Habits develop in the same slow, painstaking ways. People who have strongly developed habits of personal cleanliness feel uncomfortable when they are dirty, and would not allow themselves to sit down to a meal without first washing the face and hands. The habit of exercising in the open air

leads us out of doors much more frequently than would otherwise be the case. Even the weather is not allowed to interfere because suitable clothing for all weathers can usually be secured. The habit of cleaning the teeth before going to bed and immediately upon rising in the morning goes a long way toward saving us from hours of pain and needless

These boys have formed the habit of washing before meals. A basin forms a fine wash stand in camp.

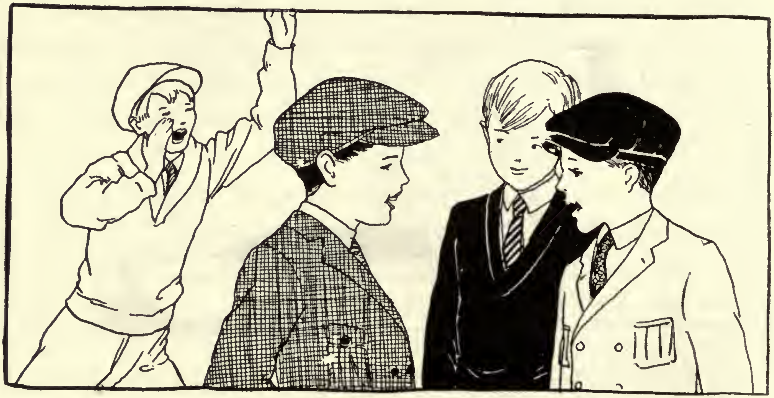
expenditures of money. It is not difficult to extend this list of illustrations to include every one of the health habits we try hard to develop.

Disposition and Character Are Habits:

Each of us, no doubt, knows some one who has a sunny and cheerful disposition. There is always a

cheery smile and a kindly greeting for everyone. Then we occasionally meet persons for whom everything seems to go wrong. They appear to be unhappy, and are usually cross and irritable.

An important thing to remember in either case is that the nerve cells find it easier to act in these ways as time goes on. In the first instance, good nature and cheerfulness become habitual. Friendships are



Begin the day right. Be cheerful from habit.

easily made and the fortunate possessor of such a disposition is welcome everywhere. Quite opposite habits develop in the other case. It soon becomes almost impossible to keep from finding fault and acting cross and mean. It is hard to make friends and still harder to keep them, and the persons lead most unhappy lives.

Character, likewise, is built upon a foundation of habits. The habits of thoughtfulness, fair play, honesty, and all the others which go to make it up are developed only in the same slow, thoughtful ways that are needed in the formation of all habits. The nerve cells which direct and control these actions grow accustomed to their work by use. The Scout requirement of doing a good turn each day finds its permanent value deep down in the nerve cells which grow accustomed to their work by use.

Bad Habits Are Hard to Break. It takes time and effort to break a habit just as it does to form one. The first step is to think about the thing that is to be discontinued and to keep thinking about it until the habit is broken. In stopping the bad habit of biting the finger nails, for example, you must think about it constantly for awhile, for just as soon as the attention is occupied with something else, the biting goes on as before. If enough effort is given to it, the bad habit will gradually disappear and you will no longer need to think about it at all.

Sometimes the easiest way to break a bad habit is to substitute a good one for it. Habits of proper posture can readily be formed to take the place of improper ones; right methods of cleaning the teeth can be substituted for wrong or careless ones.

I remember an old saying that the easiest way to break a bad habit is not to form one. When we know that it takes no more time and effort to form a good

habit than a bad one, it does seem rather foolish to waste energy in forming habits that later will have to be broken up, not to speak of the harm that may come from the bad habits while we have them.

Our Thinking Powers Must Also Be Trained:

The higher, or thinking, centers of our brain, as well as the lower ones which control our habits, are strengthened and developed by use. We are sometimes called upon to read, or write, or study in places where other things are going on at the same time. We can train our attention and our thinking powers to attend to their work without being disturbed too much by the distractions round about us. Then, again, there are right ways and wrong ways to study. Proper study habits can be developed only by steady practice. We should take pride in learning to think for ourselves and not get into habits of depending too much upon others to do all our thinking for us.

Youth Is the Best Time for Training the Nervous System:

At the age of seven, the brain has nearly reached its full growth in size and weight, but the nerve cells which compose it go on developing for years and years beyond this age. The reason that some persons are brighter than others and think more quickly and know more, is not that their brains are

larger or heavier, but is because they are better trained and developed.

While it is not impossible to learn new things at almost any age, it has been found to be much easier during the years of youth than at any other time. During these years it is easiest to memorize things, acquire foreign languages, form habits of all kinds, learn to play the piano, and to do the many other things that require the development of new connections between the nerve cells in the brain. The ease with which things are learned during these early years of life is an important reason for attending school regularly and making the most of the opportunities that are offered for these purposes.

IMPORTANCE OF CARING FOR THE NERVOUS SYSTEM

So many things depend upon the proper growth and development of the nerves and the nerve cells that we should do all we can to help them in their work and shield them from harm and injury.

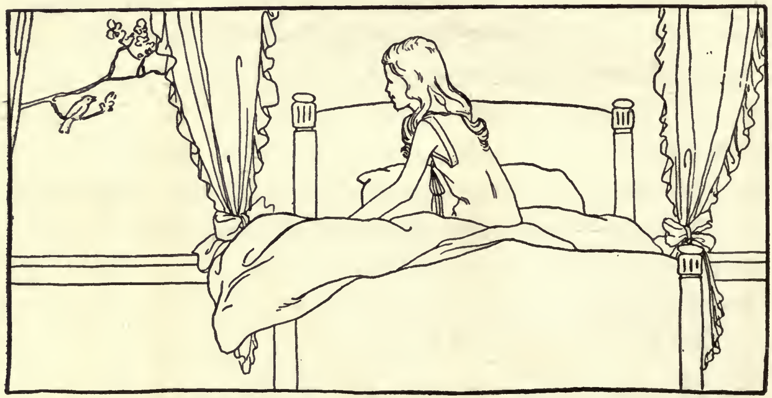
The nervous system is helped by proper food and sufficient rest and sleep. It is injured by alcohol and tobacco, and may be caused to suffer from the poisons of fatigue.

Nerve Tissue Must Be Nourished:

Nerve tissue is living tissue and needs proper food for its growth and repair. Good wholesome foods

strengthen the nerves and nerve cells and help to keep them active and healthy.

The regular elimination of the body wastes prevents injury to the nerve cells and interference with



Rest and sleep refreshes the body and mind.

their work from the poisons which form when such waste products are allowed to accumulate within the body.

The Nervous System Needs Rest and Sleep:

The nervous system is the part of the body which has the greatest need for rest and sleep and which benefits most from them.

It is during rest and sleep that the worn out parts of the nerves and nerve cells are repaired and their nervous energy restored. It was pointed out in the chapter on the muscles that sleep is the best form of

rest, and that a good night's sleep is refreshing both to the body and the mind.

Over-excitement and late hours injure the nervous system more than any other part of the body. It overworks the nerves and interferes with their rest. The habit of attending motion pictures too often causes nervousness and eye-strain.

Work Hard—Play Hard—each at the proper time.

Rest and sleep are needed to remove the poisons of fatigue. Continued failure to heed these warning signals that the body needs a rest often paves the way for serious nervous troubles. Long periods of study

are often relieved by play and other forms of muscular exercise. On the other hand, it is restful to read and relax quietly after vigorous muscular work or play.

Alcohol and Tobacco Injure the Nervous System:

Alcohol injures the nerve cells and interferes with their work. The higher powers of the brain are among those which are affected first. Reason and judgment are impaired. Self-restraint is weakened. It causes a person to become reckless and do things that would not be done at other times. It is not long before the nerve cells which control the muscles become poisoned. Walking grows unsteady and speech is thick and uncontrollable. The final stage is a heavy stupor which remains until the effects of the poisoning have disappeared.

The poisonous nicotine in tobacco also injures the nerve cells. It is especially harmful to young people, and at any age often results in nervousness, trembling, and an irregularity in the beating of the heart. The smoker's heart is often called a "tobacco heart" because the nerve cells which control its beating have become affected. It is likely to beat too fast at times and then too slowly at others.

Helpful Things to Do

1. Ask a relative or friend in a business establishment to tell you how the work is directed and con-

trolled. Report your information to the class. Compare this with the organization of the nervous system for the direction and control of the body.

2. Place the end of your finger over the area of the brain which controls sight.

3. Select a habit you would like to break, if you have one. Plan a program to follow in breaking it. Can a good one be substituted for it? Why do many people select New Year's Day or their birthday or other special occasion to commence the breaking of a habit? Is it necessary to do this?

4. Rip Van Winkle, in Washington Irving's story by that name, often tried to stop drinking intoxicating liquors. If he took a drink during one of these habit-breaking periods he would always excuse himself by saying that he "would not count that one". What part of his body did count it each time if Rip himself did not? Would this hinder in breaking the habit?

Questions and Health Problems For Discussion

1. What are the two essential parts of any system of direction and control? What happens when one of them is interrupted?

2. How is the nervous system organized for the work of direction and control?

3. What is the part played by the brain in this work? By the nerves? To what part of the system

of direction and control of an army does the brain compare? The nerves?

4. What is the function, or use, of the cerebrum? The cerebellum? The medulla? What happens when each is injured?

5. How is the brain protected? How is the spinal cord protected?

6. What is meant by saying that the spinal cord is a "trunk line" of nerves connecting the various parts of the body with the brain?

7. What duties of the spinal cord cause it to be included as a part of the central nervous system?

8. What are the two kinds of nerves? What are the duties of each kind?

9. What two conditions govern all muscular action?

10. Name some voluntary actions, or movements. Name some involuntary ones. Which of these are directed and controlled by the higher centers of the brain? Which by lower centers?

11. Describe the appearance of a nerve under the microscope.

12. Name three things done by the nerve cells.

13. What are habits? What is the economy of habits?

14. One person has formed the habit of cleaning the teeth just before going to bed and just after rising each morning, and another has not. Which one

is more likely to suffer from toothache sooner? Why?

15. Do you ever get cross and disagreeable? What may happen to your disposition if it happens too often?

16. Why is the Scout requirement of doing a good turn each day a fine training for the later years of life?

17. Concentration of attention is a habit. Why is it easier to form this habit in a quiet place than in a busy, noisy one?

18. Why is youth the best time for learning new things?

19. Why are rest and sleep so important for the nervous system?

20. What is fatigue? How can it be relieved?

21. After studying hard, which is the better way to rest, play out of doors or sit down with a book to read? Why?

22. What harmful effects does alcohol have on the nervous system? Tobacco?

CHAPTER XXIII
THE SENSES

The senses are the "news gatherers" of the body. They collect the "news" of all that is going on round about us and send their messages of information to the brain by way of the sensory nerves. Through them the brain keeps informed of all that is going on in spite of the fact that it is shut away securely in a strong, bony case.

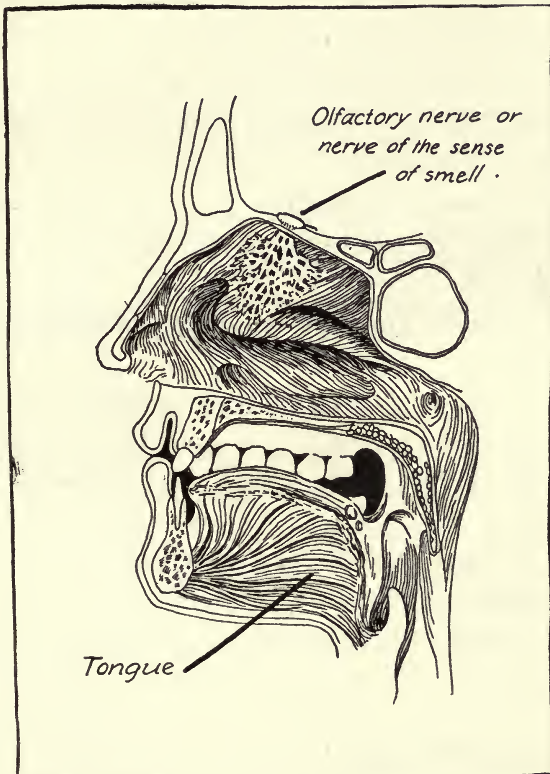
The whole arrangement reminds us in a general way of the organization of a great modern newspaper. Its reporters and correspondents located in all parts of the world send back their "news" to the central office by letter, telegraph, and cable. Nothing escapes their notice. In our body, the sense organs are its "reporters" and "correspondents," and the "news" they gather is forwarded to the central nervous system by the way of the sensory nerves.

Our Many Senses:

The work of "news gathering" for the body is divided among a number of different *senses*. Each sense collects only that kind of information for which it is especially adapted. The sense of sight, for example, concerns itself solely with light, while the sense of hearing can react only to sounds.

For purposes of study, our many senses divide themselves naturally into two groups as follows:

(1) *Those which keep us informed of conditions and events in the world round about us,* or external senses.



The Nerve Endings of Smell are located in the Nose. Those of Taste are found in the Tongue.

(2) *Those which keep us informed of conditions inside the body itself,* or internal senses.

Our "External" Senses:

These keep us informed of conditions and events in the *outside world* and include the following:

(1) *Sight,* which enables us to see things.

(2) *Hearing,* through which we become aware of sounds.

(3) *Taste,* which gives us information about the things we eat and which helps us to enjoy our meals.

(4) *Smell,* through which we become aware of odors.

(5) *Touch,* through which we gain a wealth of information about the qualities of things, like hard and soft, rough and smooth, and so on.

(6) *Temperature,* through which we learn of conditions of heat and cold.

(7) *Pain,* which warns us of injuries to our bodies.

Our "Internal" Senses:

These keep us informed of conditions *inside the body* itself and include:

(1) *The sense of hunger and thirst,* through

which we learn of the needs for food and drink.

(2) *The sense of movement and strain.* This sense is felt in the muscles and joints and helps us to guide and control our movements.

(3) *The sense of equilibrium and balance,* through which we are able to keep the body balanced in its various positions of rest and motion. It is located in the semi-circular canals of the ear.

(4) *The sense of pain.* This sense informs us of conditions within the body as well as of dangers from without, and should be included within this group.

THE SENSE ORGANS

The parts of the body which contain the sensory nerve endings are called the *sense organs.* The nerve endings of several of the senses are rather widely scattered throughout the body, like those for touch, temperature, and pain in the skin, and those for movement and strain in the muscles and joints. Nerve endings for other senses are found closely grouped in certain places, like those for smell in the nose and taste in the tongue, while the endings for two of the senses are enclosed within organs especially constructed to receive them, the eye for sight and the ear for hearing.

The Work of the Senses and Sense Organs:

Most of us have long been familiar with many important facts connected with sense organs. It is through them that we have gained the greater part of our knowledge of things about us. We have learned to know their value in warning us of possible dangers and injuries. We have found out that they can be trained to serve us well in many ways.

In order to carry a message to the central nervous system, some form of *stimulus* is necessary. Waves of light, for example, stimulate the nerve endings in the retina of the eye and start the message to the brain. There, in the brain, the message is received and interpreted, and we *see* the object before our eyes. Similarly, sound waves form the stimulus to the nerves of hearing in the ear. Actual pressure on the nerves in the skin enables us to feel things and benefit from the sense of touch. Substances dissolved in liquids can be tasted, while tiny particles in the air stimulate the nerves of smell. Thus, each sense organ has its own particular form of stimulus to which it responds. It cannot react to the stimulus of another.

Importance of Caring for the Sense Organs:

Our sense organs are so valuable that we should take care to prevent their abuse and injury. No one of us would deliberately injure them but at the same

time we may allow the same effects to result from their neglect or careless use.

The temporary loss of the services of even one of our sense organs usually causes us much distress and inconvenience. It is only with great patience and effort that another sense can be trained to make up to a certain extent for the loss of one or more of them.

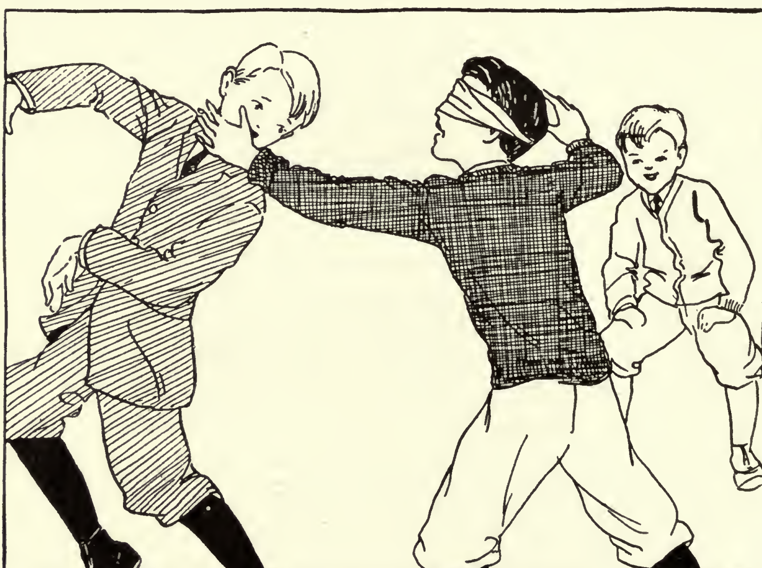
One of the most wonderful illustrations of the overcoming of such obstacles is in the story of the life of Helen Keller. Miss Keller lost the senses of both sight and hearing when she was not quite two years old. She grew up to school age without being able to speak, and knowing hardly anything about the most common objects around her.

Today Helen Keller is still unable to see or to hear but she is a college graduate, knows several foreign languages, and has written several books. She has told about her efforts to overcome her handicaps in her book called, "The Story of My Life".

In this book she tells how her patient teacher began by spelling out words on the palm of her hand. Then, by feeling the actual object and the spelling of its name, she began to learn that there were many different things in the world and that each had a name. For quite a while, as she writes in the story of her life: "I did nothing but explore with my hands and learn the names of every object that I touched, and the more I handled things and learned

their names and uses, the more joyous and confident I grew."

She next learned to read these names by passing her finger-tips over the raised letters that are used in books for the blind. Another step in her training was completed when she learned to tell what people were saying by placing her finger-tips on their lips and throats while they spoke. Then, most wonderful of all, she learned to put her own lips, teeth, and tongue in the proper positions to form words so that she could speak out loud herself. She, of course, did not hear her own speech, but it has enabled her to tell



Blind Man's Buff–the Sense of Touch

audiences the story of her life and lecture on other subjects as well.

Such training, you may know, took years and years of time and a vast amount of patience and effort on the part of both pupil and teacher. Little by little the sense of touch was substituted for other senses but, at its best, it could not do their work as well as they themselves could do it. We should be very thankful for the use of all our senses and try harder than ever to protect them from injury.

Helpful Things to Do

1. Try to secure a copy of a book used by the blind. What sense is called upon to read it?

Questions and Health Problems For Discussion

1. What are the duties of the senses?

2. Explain why the senses can be referred to as the "reporters" and "correspondents" of the body.

3. Name the senses that keep us informed of things in the outside world; of happenings inside the body.

4. What are the sense organs?

5. Point out the sense organs for each of the "external" senses. What is the stimulus of each?

6. What is the value to us of the sense of pain? What things might happen if this sense should be lost?

CHAPTER XXIV

THE EYES AND THE SENSE OF SIGHT

Taking pictures! What a lot of pleasant memories return to those of us who have a camera. We never cease to wonder at the way in which the faces of our friends, a beautiful scene, or the exciting moments of a game are all gathered in and recorded for us by the little box-like toy we call our camera.

Have you ever realized that we have two little cameras of our own? Our eyes are really little cameras in both the way they are constructed and in the way they do their work. They busy themselves all through our waking hours with the gathering in and recording of the scenes and happenings all about us. Through them we learn of light and darkness, colors, size, form, distance, and many other things that interest and protect us.

The Eyeball as a Camera Box:

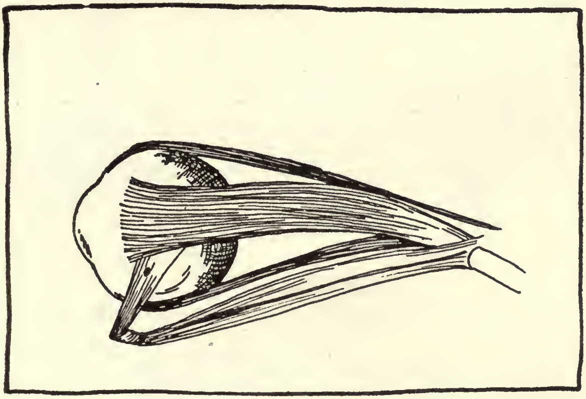
The eyeball, first of all, is the camera box of the eye. It is a rounded, spherical, or ball-shaped, body about an inch in diameter, fitting snugly in a hollow socket in the bones of the skull. It is held in place and moved about in its socket by six different muscles which are attached to it.

It is covered on the outside by a thick, tough membrane which helps to protect it. It is this outer coat

we see as the "white of the eye". Right in the front, the eye bulges slightly outwards and becomes transparent. This forms the *cornea,* or little "window", of the eye through which all rays of light must pass.

The interior of the eye is filled with a clear, transparent, colorless substance which completely surrounds the other delicate structures within it.

Like a camera-box, the eyeball is lined with black. This black *choroid coat,* as it is called, covers the

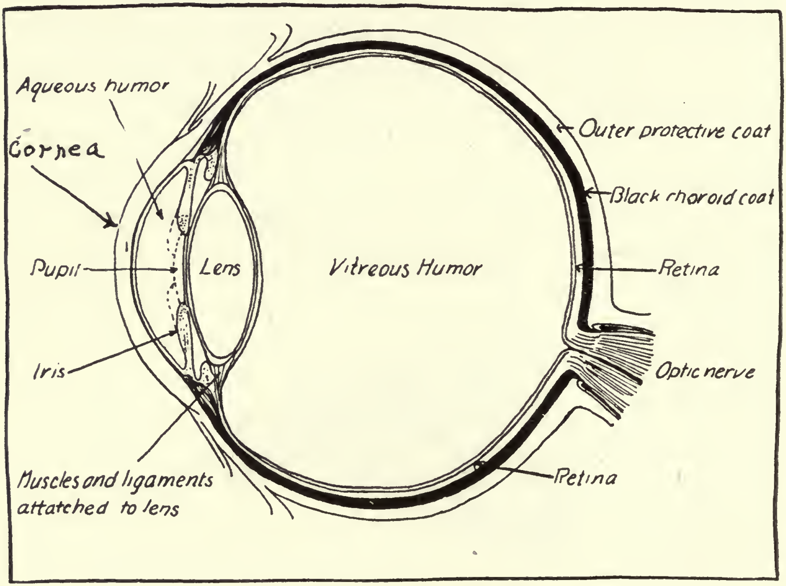


Muscles which move the eye

whole of the interior of the eyeball. It prevents light from entering the eye at any place except through the little *pupil,* or opening, especially provided in the front of the eye for this purpose.

The eyeball is also supplied with nerves and blood-vessels. These enter the back of the eye and spread out to all parts that need them. The *optic nerve,* or

nerve of sight, begins to branch soon after it enters the eye and continues to divide and branch until its endings are spread out over the entire back half of



The Parts of the Eye

the interior of the eyeball. It is these endings that form the *retina,* or sensitive surface, upon which the picture, or image, is formed.

How the Eye Is Protected:

The eye is so delicate that it is protected in several ways. Its position within a socket in the bones of the skull helps to protect it.

The eyelids protect the eyes by closing over them. A part of the eyeball is always covered by the eyelids and, in case of approaching dangers, they shut tightly and completely cover its delicate surface.

The eyebrows and eyelashes give some additional protection by keeping foreign substances from getting into the eye.

The eyeball is constantly moistened and washed by a watery liquid which flows down over its surface from the tear glands. The opening and closing of the lids spread this moisture over the surface of the eye and clean it. The moisture passes off through a tiny passage leading from the inner corner of the eye into the nose. When the moisture is secreted too fast, the drops run over and form the tears that come with crying.

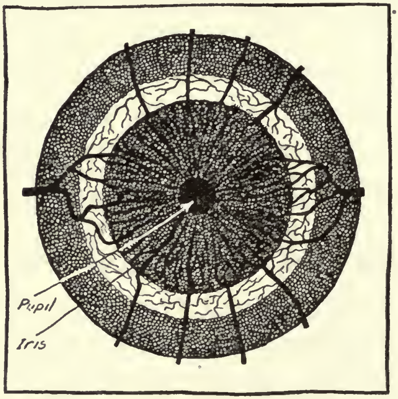
Regulating the Amount of Light Which Enters:

A camera has a shutter to regulate the amount of light which is admitted. In bright sunshine the opening should be narrowed, while on dull days it must be opened wide in order to let in all possible rays of light.

The eye has a "shutter" called the *iris*. This little curtain is really a part of the black inner lining which is stretched across the front of the eye just in back of the cornea. It seldom looks black, however, because of the pigment or coloring matter it contains.

Our eyes are blue, brown, or other color according to the kind of coloring matter in the iris.

In the center of the iris there is a little opening called the *pupil* of the eye. Tiny muscles in the iris enable it to change the size of this opening according to the amount of light which should be admitted. In a very bright light, the pupil narrows, while in a dim light it opens wider in order to let in all the light it can. It is easy to observe the changes in the size



The iris and pupil of the eye

of the pupil by standing before a mirror and bringing a light before the eye and then taking it suddenly away. The pupil always appears black because of the black choroid lining of the eyeball which shows through it.

The Picture Should Be Clear and Distinct:

Good pictures are clear and distinct. A blurred or indistinct camera picture shows that some part of the camera has not been used correctly.

You may have seen a photographer turn a little screw back and forth. This sets the lens so that the rays of light that pass through it are brought to a *focus* upon the ground glass plate at the back, forming a clear and distinct image upon it.

The rays of light that enter the eye must likewise be brought to a focus upon the sensitive nerve endings in the retina. If they are not properly focused, the image of the view before our eyes will be blurred and indistinct. The eyeball is not able to lengthen or shorten in order to get this proper focus, so that a *lens* is provided for the purpose. The lens of the eye is a very clear, transparent, oval little body situated just behind the iris. It has ligaments and muscles attached to each end of it which hold it in place and enable it to change its shape as needed. When we look at an object at a distance, the lens becomes flatter. When we look at nearby objects, it becomes more rounded and curved, so that the picture will be clear and distinct.

How the Picture Is Taken:

As I look up from my book, I see my neighbor's flower garden across the street. I see each line and curve, each change of light and shade and color

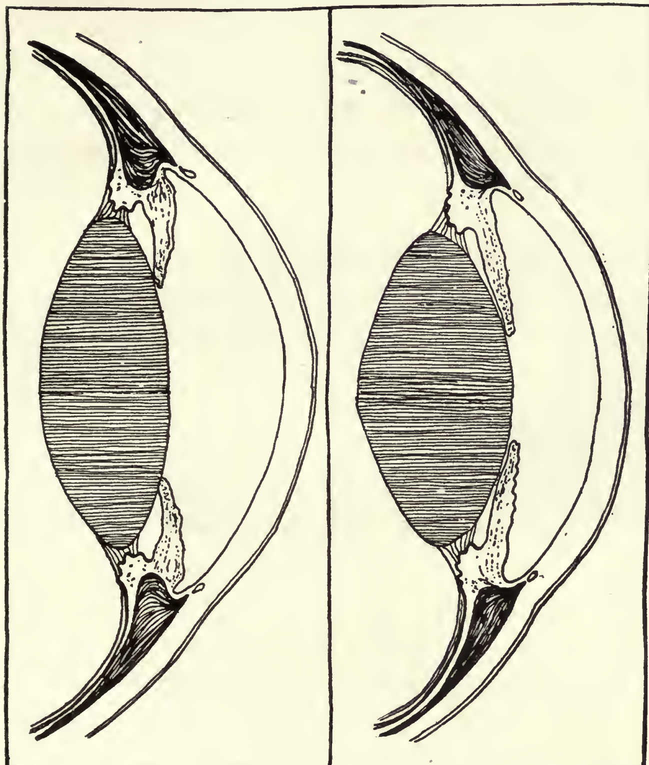
exactly as it is. No more is added, nothing is left out.

In all except its color, this view I have of the flower garden and a camera snap of it are both alike. In a camera, the rays of light pass through the lens and imprint the picture upon the sensitive plate or film at the back. In the eye, the rays first enter through the cornea, travel through the pupil and the lens, and back to the retina where the image is formed. This image, or picture, is then carried to the brain over the fibres of the optic nerve. In the brain, these messages are received and interpreted and we see the view before the eyes.

Then I look back on the pages of my book and a different picture is immediately focused upon the retina and reported to the brain.

Why Some People Need Glasses:

If the eyeball is shaped correctly and the lens works properly, it is possible to see both far off and near-by objects clearly and distinctly. Now and then, however, the shape of the eyeball or the lens is such that it prevents the proper focus. If the eyeball is too short from front to back or the lens is too flat, near-by objects will be blurred and indistinct. Far off objects can be seen clearly, however, and such persons are termed *far-sighted.* If the eyeball is too long from front to back or the lens too rounded, far-off objects will be blurred and indistinct while near-by



The lens on the right is shorter and thicker, more rounded and curved, than the one shown in the drawing on the left. The shorter, thicker lens brings nearby objects to a focus. For distant objects, the lens becomes thinner and longer. The shape of the lens is regulated by muscles over which we have no control.

objects can be clearly focused. Such persons are termed *near-sighted.*

In cases such as these, eye-glasses are merely additional lenses which correct the defect of the eyeball or lens and enable the image to be focused clearly and distinctly upon the retina.

How to Tell That Glasses May Be Needed:

In many school systems, the pupils' eyes are regularly examined and slight defects are brought to light. These often can be remedied before serious damage has resulted to the eyes.

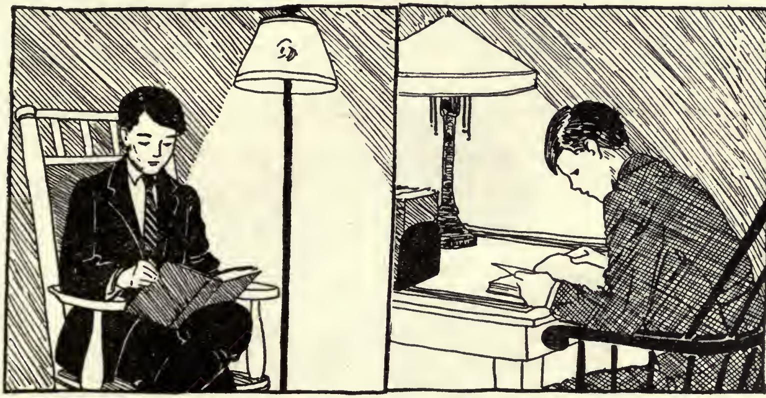
Eye-strain often indicates that glasses are needed to assist the muscles of the eye in getting and keeping the proper focus. This condition shows itself in several ways. The eyes may burn or smart or feel strained after they are used for some time. Headaches are quite frequent. The letters of a book look blurred or dance about. Spots appear before the eyes. When these or any other unusual eye conditions are noticed, an expert should be consulted at once. Our sight is too precious to be injured through carelessness or neglect.

Proper Care of the Eyes:

The amount of light that strikes the eyes should be carefully regulated. It should be neither too bright nor too dim. Both conditions strain them. It is best to have the light shine over the left shoulder

and in no case should it be reflected directly from a book or other surface into the eyes.

It strains the eyes to use them too long in reading, sewing, or other work that requires close attention



There is a right and a wrong way to read. In the picture on the left you see that the light is above the level of the reader's eye and that it does not cast a glare directly into the eye. The book is held at a proper distance.

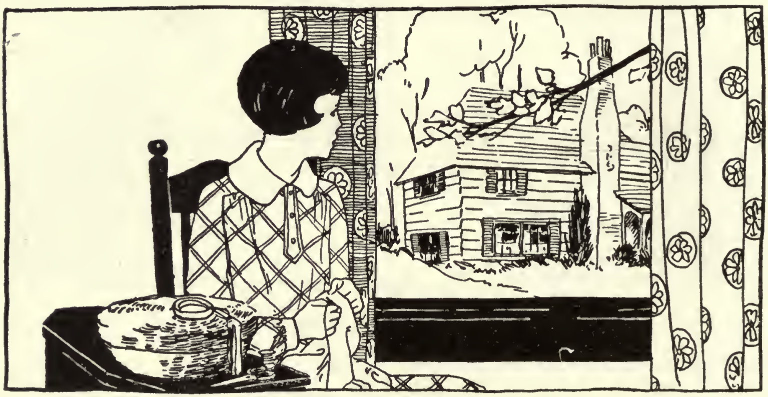
In the picture on the right the light from the lamp is reflected directly up into the eyes. This strains and injures them.

and constant focusing by the muscles. Rest the eyes occasionally by *looking away* from the work before them. This changes the focus and relieves the muscles.

Do not read upon moving cars. The jolting makes it difficult to keep the focus.

Do not read while lying down or with the head bent forward.

Many cases of weak and defective vision can be prevented by taking care of the eyes during and right



In doing close work, rest the eyes by looking away from the work from time to time.

after diseases like measles, scarlet fever, diphtheria, and others. Injury to the eyes at such times frequently lasts through life and cannot be entirely corrected by glasses.

Guard against infection of the eyes from using towels which are found in public places. Eye diseases are often passed from person to person in this way.

To Remove a Foreign Body From the Eye:

Do not rub the eye. This may press the particle into its delicate surface and make it harder to remove.

Close the eye for a few moments and the tears may wash out the piece of cinder, sand, dust, or other substance that is caught within it. If this does not

Removing a foreign body from the eye.

work, pull the upper lid down over the lower one and hold it there. Close the nostril on the side opposite to the eye containing the offending particle and blow the nose.

If it still remains, get someone to examine the surface of the eyeball and the inner sides of the lids. This is easily done by turning the lids back over a tooth pick, match stick, or pencil and then wiping the foreign body off with the folded tip of a clean handkerchief.

Helpful Things to Do

1. Observe the changing size of the pupil of the eye. Look into a mirror. Bring a light close to the eye. What happens? Take the light away. What is the result? Of what use is this in the sense of sight?

Questions and Health Problems For Discussion

1. Describe the eyeball. How is it held in its place? How is it moved? How is it protected?

2. What is the cornea? The iris? The pupil? The lens? What is the use of each?

3. What is the retina of the eye? What part does it play in sight?

4. Explain how the images of near and distant objects can both be clear and distinct?

5. How do glasses improve defective vision?

6. Discuss some of the symptoms of eye-strain. What should be done if any of them appear?

7. Why is it especially harmful to read at dusk or twilight?

8. How can the eyes be rested after reading, sewing, or doing other close work.

9. What conditions may cause a pupil to hold his book very close to the eyes to read? What should be done in such cases?

10. Discuss the proper care of the eyes. Can you add to the things mentioned in the text?

CHAPTER XXV

THE EARS AND THE SENSE OF HEARING

It is through the sense of hearing that we learn of the world of sounds. It provides us with useful information, warns of approaching dangers, and makes possible the pleasures of conversation and the joys of music.

THE EAR

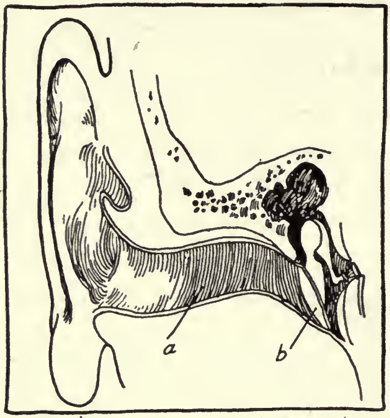
The ear is the organ of hearing. It should be known, first of all, that the part of the ear that we see is only a small portion of the whole delicate structure that enables us to hear. As shown in the diagram on page 344, the ear really consists of three parts, commonly known as the *outer ear, middle ear,* and *inner ear.* Two of these parts, the middle ear and inner ear, are hidden securely away in the bones of the skull. The outer ear is partly exposed to our sight.

HOW WE HEAR

You have seen wave after wave spread out from a stone that has been thrown into a pool of water. When you clap your hands or strike a bell, sound waves travel out into the air in the same way.

Some of these sound waves enter the ear and pass on through its various parts until they stimulate the

nerves of hearing into reporting the happenings to the brain. In the proper area of the brain this in-



a-canal b ear drum

Sketch of Outer Ear, showing canal and ear drum.

formation is received and interpreted, and we *hear* the sounds.

Part Played by the Outer Ear in Hearing:

The part of the outer ear that we see is composed of cartilage shaped so that it will gather in and collect the waves of sound. These waves are then conducted through a little tube until they strike the tough elastic membrane called the *eardrum,* which is stretched across its inner end. This sets the eardrum in motion.

The Middle Ear Carries the Sound Waves On:

The middle ear is a little air-filled cavity in the bone of the skull. It is constructed in such a way

that the sound waves that have been collected by the outer ear will be carried across it into the inner ear where the nerves of hearing are located.

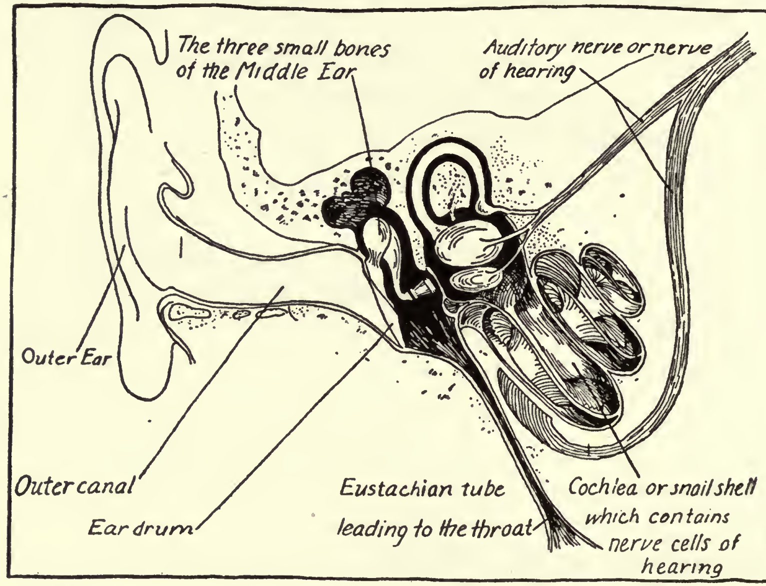
The eardrum is stretched between the middle ear and the outer ear. Another elastic membrane also divides the middle ear from the inner ear, thus giving the middle ear an elastic wall on either side.

These two membranes are then connected by a remarkable chain of three tiny bones, called the *hammer, anvil,* and *stirrup,* from their resemblance to these objects. These bones are joined to each other, with the hammer fastened to the eardrum and the stirrup to the inner membrane. Therefore, when the eardrum vibrates, the vibrations are passed along through this chain of bones and set the inner membrane in motion.

The Inner Ear and Hearing:

The inner ear lies securely imbedded in the bone of the skull. It somewhat resembles a snail shell in its shape, with winding canals filled with lymph. The nerve endings of the *auditory* nerve, or the nerve of hearing, float in this lymph. Thus, when the membrane separating the inner ear from the middle ear is vibrated, the vibrations set up waves in the lymph. These waves stimulate the nerve endings and start messages to the brain where they are received and interpreted as sounds.

Besides the *cochlea,* as the winding canals containing the nerves of hearing are called, this inner ear contains three small *semi-circular canals* which are



The ear is a delicate and complicated structure. The Middle Ear and Inner Ear are securely enclosed within the bones of the skull.

connected with our sense of balance, or equilibrium. Injury to these semi-circular canals causes a person to stagger and lose the balance.

The Opening Into the Middle Ear:

The middle ear is filled with air. This air enters it through a tube which leads from the back part of the

throat. This *Eustachian Tube,* as it is called, makes it possible to keep the pressure of the air equal on both sides of the eardrum. This lessens the danger of bursting the eardrum by greater pressure on one side than on the other. Gunners are instructed to open the mouth when large guns are fired so that the great pressure of the air at the time of the explosion can reach the middle ear and press outward upon the eardrum with as much force as it presses inward.

It should be known that while the Eustachian tube performs an important service for the ear, it opens the way to a great deal of trouble as well. Germs of colds, grippe, and other diseases that affect the throat, sometimes travel up this tube and lead to trouble in the middle ear. The inflammation and swelling at such times cause severe pain and a hardness of hearing. Such conditions need prompt expert medical attention to keep them from spreading to other parts of the ear and to prevent permanent deafness. If such infection spreads inward from the middle ear, it becomes a very serious matter, occasionally with fatal results. Spreading outward, it causes running and discharging ears, which need constant treatment to prevent a permanent injury to the hearing.

Blowing the nose violently is very likely to force infection from the throat up through the Eustachian tube into the middle ear. It is safer to blow one

nostril at a time, keeping the other one tightly closed by the pressure of the fingers.

Care of the Outer Ear:

The ears are best cared for by letting them alone. Things should not be pushed into the canal of the outer ear, nor should it be cleaned with sharp pointed or hard instruments. This canal secretes a sticky wax which serves a useful purpose in catching dust or tiny insects which find their way into it. Any excess wax that collects in the outer part of the canal can easily be removed by covering the end of the little finger with a single thickness of a handkerchief or towel and cleaning gently. The rolled-up end of a handkerchief or towel also will answer the same purpose without danger of injuring the eardrum. Do not use hard instruments of any kind for this purpose because the eardrum is easily punctured by them.

Blows on the ear are dangerous because they often drive waves of air into the ear with force enough to break the eardrum. Loud noises are likely to cause the same result unless the mouth is kept open to equalize the pressure on the two sides of this membrane.

Pulling the ear is a dangerous practice because of injury to the delicate structure of the ear which may result from it.

Deafness:

Hardness of hearing, or deafness, is a condition which ranges from a slight defect all the way to total deafness. It may be only temporary, or it may be permanent.

Temporary deafness often comes from colds in the head and disappears when they are cured. It is sometimes caused by adenoids which help to block up the opening into the Eustachian tube. Deafness from this cause is usually relieved by the removal of these harmful growths. Temporary deafness also results from hardened collections of wax in the canal of the outer ear. Such obstructions can sometimes be softened by dropping a little warm glycerine or castor oil into the ear and wiping the loosened wax away as it works its way out. It is best, however, to secure the services of a medical expert who is trained to do this work without injury to the eardrum.

Deafness caused by injury to the nerves of hearing or by injuries to the bones in the middle ear is not so easy to remedy, and cannot be relieved at all in many cases. This should be reason enough to keep us from meddling with our delicate organs of hearing and from neglecting to get the proper treatment for them when they need it. The results of neglect and abuse are too serious to take needless chances with them.

Helpful Things to Do

1. Test the hearing by listening to the ticking of a watch held at different distances from the ear. If

Testing the hearing with a watch. Never neglect ear trouble of any kind.

there is any doubt as to sharpness of the hearing, consult a physician immediately.

Questions and Health Problems For Discussion

1. What is the difference between the sense of hearing and the organ of hearing?

2. Name the three parts of the ear.

3. Describe the part played by the outer ear in hearing. How is this part separated from the middle ear?

4. Describe the middle ear. What separates it from the inner ear?

5. What is the purpose of the three little bones in the middle ear?

6. Describe the inner ear. What is the use of the semi-circular canals in the inner ear?

7. What is the stimulus of the sense of hearing?

8. Trace the course of the sound waves from a bell that rings nearby.

9. What is the Eustachian tube? What is its purpose?

10. Cases of running or discharging ears sometimes follow or accompany infections in the throat. Why is this?

11. Why are gunners instructed to open their mouths as big guns are fired?

12. People who go up into high mountains or divers who go below the surface of the ocean often feel strange sensations in their ears. What causes them?

13. What is the purpose of the wax that is secreted in the canal of the outer ear? How can an excess of it be removed without injury to the ear?

14. Why is it so dangerous to "box" the ears or to pull them?

15. What is meant by deafness? How may it be caused?

16. Why should earache or other trouble never be neglected?

CHAPTER XXVI
ALCOHOL AND TOBACCO

Alcohol and some of its effects have been known to the world for a long time. The discovery of tobacco and the spread of its use throughout the world are of much more recent origin. It has remained for modern methods of experiment, however, to show the exact nature of their destructive influences and to measure accurately the seriousness of their effects upon our bodies. These are so easy to understand that the responsibility for the injuries they do rests squarely upon those who use them.

ALCOHOL

Alcohol is one of the products of the process called fermentation. Fruit juices and a number of other substances which are wholesome and nourishing in their fresh condition are turned into harmful and injurious products by this process.

Alcoholic beverages are those which contain alcohol. The amount of alcohol varies among them. Drinks with a large percentage of alcohol in them cause their harmful results more quickly and do greater damage than those with less alcohol in them. All are harmful.

Alcohol Weakens Resistance to Disease:

One of the most serious results of the use of alcohol in any form is the lowering of the resistance of the body to disease. A healthy body is usually able to protect itself against the germ enemies that enter it from time to time, and to offset the poisoning effects of their toxins. Alcohol seriously weakens this resistance and allows germs to get a start which otherwise might be prevented.

Records of life insurance companies show that even the very moderate use of alcohol shortens life. Three of the results they found are as follows:

(1) *The death rate among very moderate users* of alcohol was found to be 18 per cent higher then the average death rate of those who used no alcohol.

(2) *The death rate among those who used alcohol to excess* at sometime in their lives and then stopped was found to be 50 per cent higher than the average death rate of those who used no alcohol. This shows clearly that the injury to the body by alcohol lasts long afterward, and the damage once done is not repaired.

(3) *The death rate among steady moderate drinkers* was discovered to be 86 per cent in excess of the average death rate among those who used no alcohol.

It was also found that deaths from kidney diseases, pneumonia, and suicide were more frequent among users of alcohol than among those who let it entirely alone.

Alcohol Affects the Body in Many Ways:

Alcohol is absorbed by the blood and carried to all the various tissues and organs of the body. It poisons wherever it goes, and causes effects which can be observed and measured. The following effects should be known and understood by everyone:

(1) *Alcohol lowers the bodily temperature.* This is likely to be a surprise to many users of alcohol because its immediate effect is a feeling of warmth. The alcohol first makes the heart beat faster. This forces an increased amount of blood into the skin and causes the feeling of greater warmth. This heat is soon lost into the air and as it is taken from the interior of the body much faster than it is replaced, the bodily temperature becomes reduced.

It is a well known fact that the use of alcohol is strictly prohibited in Arctic expeditions because the user is much more liable to freeze to death in the intense cold of these northern regions.

The use of alcohol is strictly forbidden in Arctic expeditions.

(2) *Alcohol removes and lessens restraint.* Excessive use of alcohol affects the brain and nervous system so that the user is not in the full control of his thoughts and actions. Self-control is weakened and things are often said and done under the influence of alcohol which would not occur at other times. Speech and laughter often become uncontrollable. Walking is affected until, finally, in cases of severe alcoholic poisoning or drunkenness, a condition of stupor, or heavy sleep, results.

(3) *Alcohol lessens the ability to do both physical and mental work.* The poison of alcohol reaches even into the muscle tissue. Its users tire more easily and do less accurate work than those who do not poison their bodies with it. It weakens the memory and interferes with the ability to think clearly and intelligently.

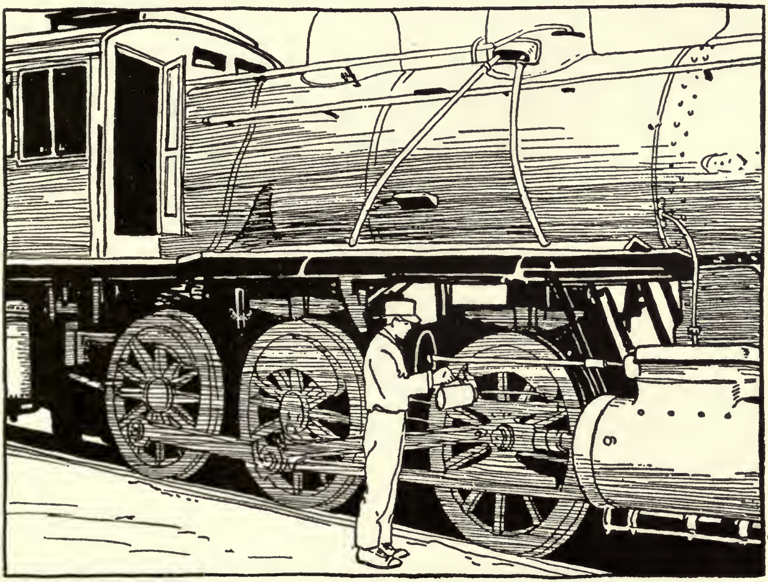
(4) *Alcohol injures the vital organs of the body.* The digestive organs are disturbed by alcohol. It especially attacks the liver, interfering with its usefulness in removing waste materials from the blood and in its storage of the sugar that is produced in the digestion of our foods. It harms the kidneys and interferes with their work of removing and eliminating the body wastes. A large number of deaths from kidney diseases are directly traceable to alcohol.

(5) *The use of alcohol becomes a habit.* This is a most unfortunate thing about the drinking of alcoholic beverages because it makes it so hard to give them up after their use is once begun. The body seems to demand a constant supply of alcohol and the user feels uncomfortable until this craving is satisfied. The habit can be broken, however, by resisting temptation until the desire for alcoholic stimulation gradually disappears.

Careful Business Men Forbid Its Use:

It is no wonder that business men forbid its use among their employees when they know that it reduces accuracy and control, lessens physical strength and endurance, and increases the number of accidents that occur.

Railroads were among the first to forbid its use. The responsibility for the lives of the passengers should be given only to those who are in the full possession of all their powers. Such work demands



His work requires a clear brain and steady nerves. Railroads have long since forbidden the use of alcohol among their employees.

constant accuracy and control. Under such conditions, the use of alcohol in any form has long since been cause for instant dismissal from their employ. Many other business men have followed the example of the railroads and have forbidden its use.

Harmful Influences in Family and Social Life:

In the home and family life, many cases of poverty, abuse, neglect, and disease are caused by alcohol.

It is responsible for sending large numbers of its users to hospitals, poor-houses, insane asylums, and prisons.

Many instances are on record in the United States, since the manufacture and sale of alcoholic liquors has been forbidden by law, of homes which are healthier, happier, and more prosperous than they were when a large part of the family income was spent for drink.

Use of Alcohol Prohibited in Time of War:

In great emergencies, like war, a nation needs all its possible resources in men, money , and materials. One nation after another during the World War realized the great wastes that come from the use of alcohol, and prohibited or greatly restricted its manufacture and sale. In the United States this was accomplished by the Eighteenth Amendment to the Constitution of the United States which prohibits the manufacture and sale of strong alcoholic liquors.

There is no good reason why the use of alcohol should be permitted in times of peace. Many of the nations that prohibited its use in wartime have continued to enjoy the benefits of such restrictions ever since. When the evils of the use of alcohol are compared with any possible benefits from it, it is very unlikely that sensible people will deliberately choose to shorten their lives and lessen their efficiency by returning to its use.

TOBACCO

Tobacco is a plant which was unknown to the civilized world before the middle of the 16th Century. About this time, the early explorers found it in use among the American Indians and carried it back to Europe with them. Its use gradually spread until today its preparation and sale is a business involving hundreds of millions of dollars each year.

A Poison in Tobacco:

Tobacco contains a powerful poison, called *nicotine.* A large part of the harm from smoking comes from the absorption of some of this nicotine into the body.

Effects of Tobacco Upon the Body:

One of its first effects is to make the heart beat faster. Long continued and excessive use results in a fluttering heart beat and pain in the region of the heart.

Tobacco disturbs the nervous system, causing headaches, trembling, and nervousness.

Tobacco smoke irritates the delicate lining of the throat. Its excessive use often causes a characteristic smoker's cough and a hoarseness of the voice.

During the growing period of life the use of tobacco is especially harmful. Its use interferes with the regular growth and development of the body which should go on without interruption during these years.

Athletes Are Forbidden to Smoke:

Smoking reduces the physical strength and endurance. The shortness of breath that results from the use of tobacco is a great handicap in many kinds of games and athletics. The lessening of control over the muscles reduces the alertness and accuracy that often bring success in athletic competitions.

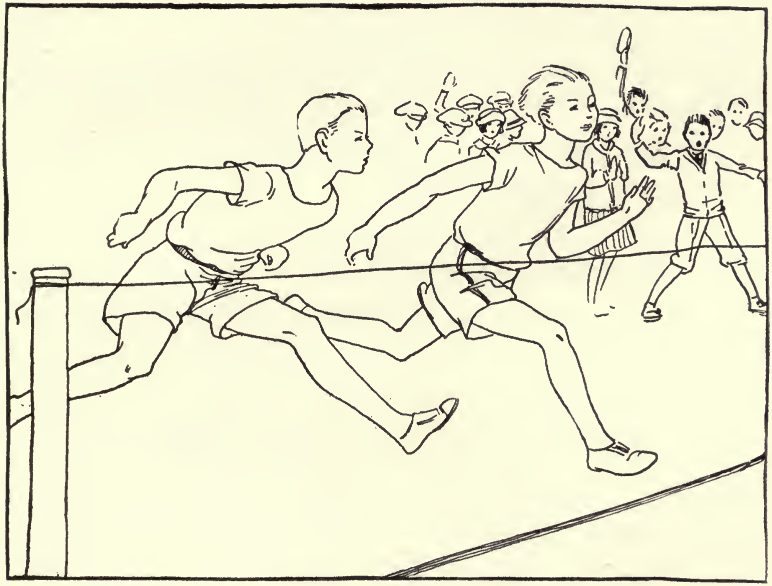
A university professor noticed that only half as many smokers as non-smokers were successful in winning places on the college football teams. Smoking interferes so much with success in athletics that many coaches, or trainers, refuse to keep students on the teams if they use tobacco during the training and playing periods.

Tobacco Interferes With Mental Work:

Experiments in laboratories with instruments especially constructed for the purpose have shown that

tobacco slows down and disturbs the processes concerned with many forms of mental work. Persons using tobacco were found to be less accurate in the addition of figures, to tire more easily, and to learn

School Relay Race—Close Finish



Tobacco lessens the endurance

new things less readily than others who were not using it.

Many studies which have been made of school records show that smoking and successful scholarship do not go well together. In large numbers of cases

the standings of pupils who began the use of tobacco were found to drop below those of the non-smokers. In all these the pupils were equal in scholarship before the use of tobacco was begun.

The following report of one of these cases about represents all the others: "Last year Wm. A. was a good student, got his lessons at one reading and made a good record. Last summer he began smoking moderately. This year there has been a decided drop in his standings, and a considerable increase in effort required to get his work".

Many Employers Object to It:

The boy who smokes is often handicapped in obtaining employment. His employer knows that loafing too often goes with smoking, and that he cannot do his best work with the body saturated with nicotine.

Smoking is offensive to many people. The smoker always carries the unpleasant tobacco smell about with him on his skin and in his clothes. Then also there is the danger of fire from the careless handling of matches, cigarette stumps, and the hot ashes of tobacco. All these things are very likely to turn a careful employer away from the user of tobacco in favor of the one who has the good judgment to let it alone.

Counting the Costs of Smoking:

It is easy to see that the money spent for tobacco is not the only cost that needs to be considered in deciding for or against the use of tobacco. Its harmful effects upon the body, its interference with scholarship. and its influence upon the character of the user are all costs which cannot be neglected. The total costs are too serious to warrant the beginning or the continuance of the use of tobacco in any form.

Helpful Things to Do

1. Ask the school physician or local health officer to tell of instances where alcohol lowers the resistance to disease.

2. Ask a number of business men why they prefer to employ boys who do not smoke.

3. From what you know of habit formation, does a boy who smokes in secret and who is forced to hide the fact in different ways deceive only his parents by his deceptions? What is happening to his character?

Questions and Health Problems For Discussion

1. What is the effect of alcohol on the bodily resistance to disease? What do records of insurance companies prove about this?

2. Alcohol is strictly forbidden in polar expeditions. Why is such a rule necessary?

3. What is meant by restraint? How does alcohol affect it? In what ways does it show in users of alcohol?

4. Why must railroads forbid the use of alcohol among their employees?

5. What is the Eighteenth Amendment? Why is it advisable for all good citizens to obey it?

6. What is the poison in tobacco?

7. What are some of the physical effects of the use of tobacco?

8. Why is tobacco especially harmful to growing persons?

9. Why do athletic coaches forbid smoking?

10. Tell about the actual cases where the use of tobacco interfered with school work.

CHAPTER XXVII

SAFETY FIRST

An alarming number of accidents still occur year after year in spite of all that is being done to prevent them. The frequency with which they appear in the pages of our daily newspapers shows that greater efforts must be made by every one to prevent them.

Many Accidents Are Preventable:

Many accidents are due to ignorance. Others result from carelessness. Some few are unavoidable.

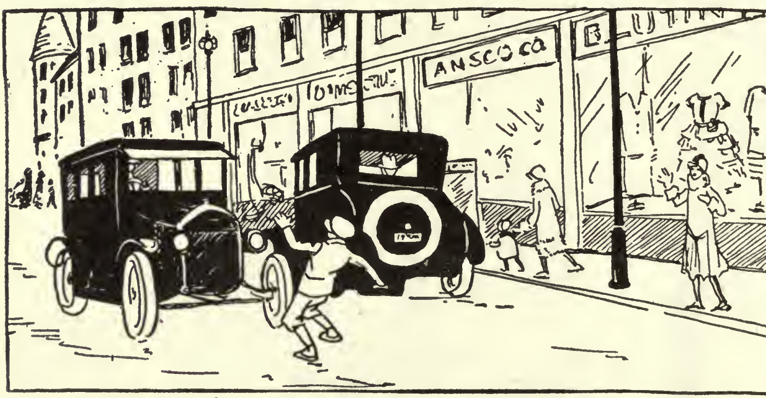
Cross Crossings Cautiously

Those that result from ignorance and carelessness are easiest to prevent. Ignorance can be removed by pointing out the dangers. Carelessness is lessened by developing habits of safety which cause us to be more watchful and to take greater care than before.

Safety Habits for the Street:

Our streets and roads are more dangerous than ever, on account of the large number of automobiles and trolley cars that use them. We need a number of safety habits to protect us from the dangers that are found there. How many of the following ones have you formed?

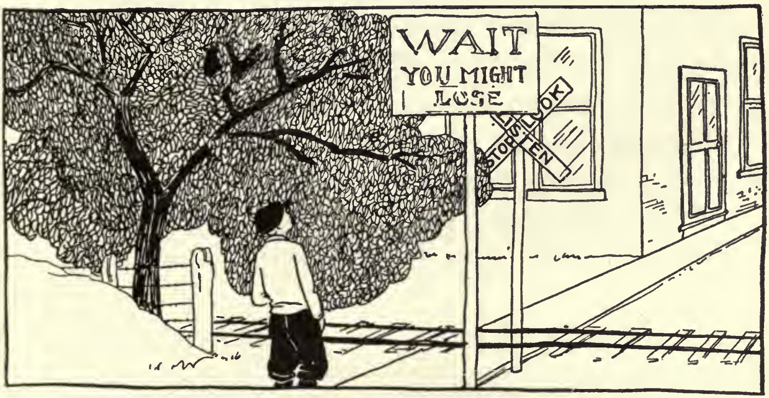
(1) *Always cross at crossings.* The motormen of trolleys and the drivers of automobiles



Stepping out from front or back of a vehicle is a very dangerous thing to do. It is also one of the preventable accidents.

and wagons expect you to cross the street at the crossing. They are usually not prepared for a sudden crossing in the middle of the block.

(2) *"Cross crossings cautiously."* This caution is often posted at street corners and railroad and trolley crossings. It directs us



to obey the signals of the traffic officers and to look carefully about us while crossing.

Many accidents are caused by stepping out suddenly from in front or from behind a trolley car or automobile into the path of another moving vehicle in the street. Only the greatest caution will prevent such accidents.

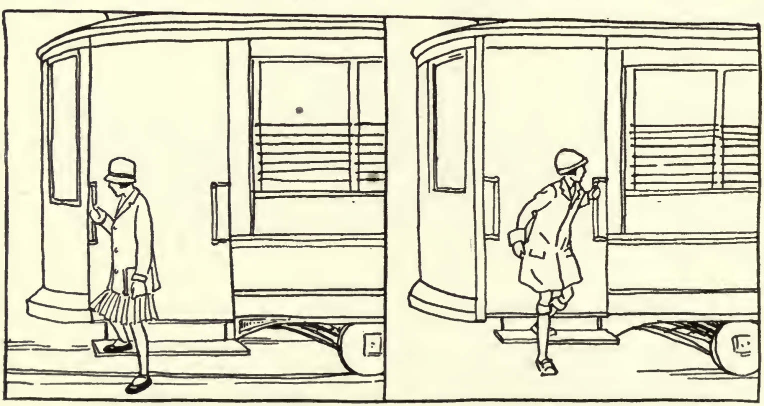
(3) *Do not "Catch On" or steal rides on the back of vehicles in the street.* This practice is so dangerous that it is prohibited by

law in many places. Not only is there danger of falling off, but so often the person who does it is struck and run over when he jumps off, by something coming along from behind. "Catching on" while on roller skates is a frequent cause of accidents in the street.

(4) *Do not "roller-skate" in busy streets.* It is quite as easy and much safer to skate on the sidewalk or seek a quiet street where there is little or no dangerous traffic. It is better even to forego the pleasure than to run the risks of skating in a busy street.

(5) *Do not step on or off a train, trolley, or other conveyance until it stops.* The loss of life or limb from being thrown under the

The Wrong Way *The Right Way*



Face forward when stepping off a car

wheels has often been the cost of carelessness in this.

It is also important to form the habit of facing forward when stepping from a car. In this position you are ready to take a forward step and prevent a sudden fall in case of an unexpected jerk or movement. In any other position you are very likely to be thrown off your balance and injured.

(6) *Where there are no sidewalks, it is safest to walk along the left side of the road* facing the traffic coming toward you. This enables you to see the vehicles which approach you. It gives you the use of your eyes as well as your ears in keeping out of danger.

(7) *Beware of broken wires.* A wire charged with electricity looks the same as one that is not. It is safest therefore to let all wires alone. Notify the proper authorities that the wire is down, and allow an experienced workman to take care of it.

These are not all the possible dangers, and you know of many others which you can add to the list; but proper habits of safety connected with even these few will go far toward reducing the painful accidents that occur too frequently all about us.

Dangers From Fire:

Burns are among the most painful injuries. When large surfaces of the body are burned they often prove fatal. Are you familiar with the dangers from matches and inflammable liquids?

Do not play with matches or with fire. Keep away from bonfires. Any possible pleasures that come from playing with fire do not begin to make up for the terrible risks that go with it.

Remember that gasoline and benzine often explode without actually touching a flame because of the fumes that come from them. Store these dangerous substances *out of doors* and keep them *tightly corked.*

Always put out the flame in kerosene and gasoline lamps and stoves before filling them. Do not, above all things, pour either kerosene or gasoline on a fire to make it burn up faster. Many fatal accidents have followed this dangerous practice.

Safety First About the School:

Many of the dangers found everywhere are present in and about the school. Certain of them take on an added importance because of the large numbers of people who gather there. Then, too, the school affords an opportunity for the older pupils to set the example of safety for the younger ones and help them to realize many of the dangers which surround them.

The following list is merely suggestive of such opportunities and can easily be lengthened:

1. *Do not run with a pencil or pen in the mouth.* A fall or sudden collision with another person may lead to a serious accident.

2. *Do not throw.* Blindness has resulted from carelessness in tossing things about in crowded places.

3. *Put fruit skins into the garbage cans* to prevent accidental falls.

4. *Avoid rough play.* Little children are sometimes knocked down and seriously hurt by older ones at play. It also may injure anyone.

5. *Follow the rules of the fire drill* to the letter. Silence and order are the first essentials. The dangers from panic and confusion are quite as serious as from a fire itself.

Helpful Things to Do

1. Look up the number of accidents of various kinds for the last few years. Are they increasing or decreasing?

2. Demonstrate the proper way to step off a train or trolley.

3. Make up a series of slogans and posters to use in a "Safety First Campaign".

Questions and Health Problems For Discussion

1. What is meant by "Safety First"?

2. Why is it helpful to develop habits of safety?

3. Why is it safer to cross the street only at crossings?

4. Describe the dangers from stepping out suddenly from the back of a trolley or automobile.

5. What accidents may result from "catching on", or stealing rides on, vehicles?

6. Why are gasoline and benzine so dangerous to have around? Where should they be kept?

7. What careless practices about the school may lead to accidents?

CHAPTER XXVIII

THE SICK ROOM IN THE HOUSE

When sickness comes, and it does come now and then in spite of all our efforts to prevent it, the sick room becomes the most important room in the house. All thoughts are centered upon it. All efforts are directed toward providing the best possible care and comfort for the patient and in assisting the doctor in every possible way.

Which Room to Select:

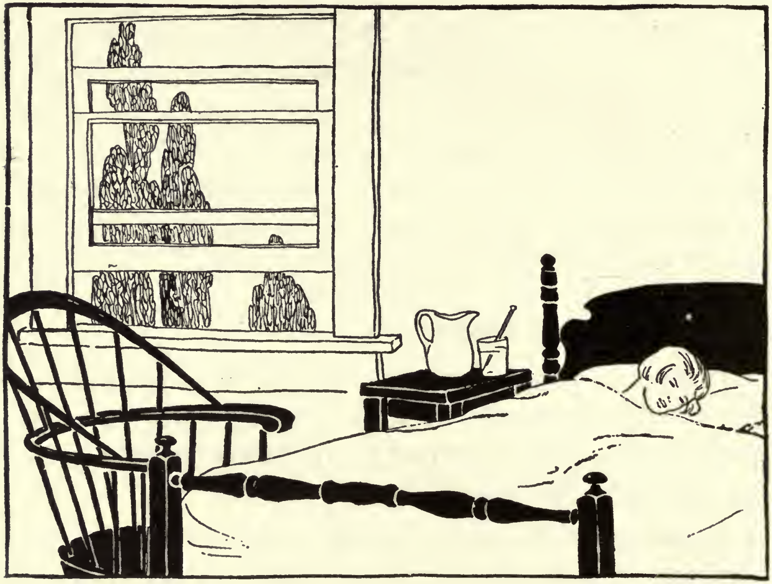
Choose a quiet room into which the sunshine and fresh air can easily find their way. Little noises which are hardly noticed in ordinary health annoy and irritate the sick.

Remove all furniture which is not actually needed for the proper care of the patient. Take down all draperies and fancy curtains. Such things collect dust and germs and interfere with the easy entrance of fresh air and sunlight. The simple curtains which are hung at the windows should be kept fresh and clean.

Remove all clothing from the closets and from within the room itself. Do not permit articles of clothing to hang about the sick room at any time throughout the illness.

Keep the Sick Room Clean:

The sick room cannot be kept too clean. Dispose of all wastes at once. Remove soiled clothing



There should be no unnecessary furnishings in the sick room.

promptly, keep it by itself and have it laundered separately. A disinfectant in the cleaning water will help to kill the germs.

Cheerfulness Helps the Medicine:

Cheerfulness in the sick room is a tonic for the patient. It helps to keep his spirits up and encour-

ages a stronger fight against the disease. Do not add your worries to his. Be always brave and hopeful in his presence.

Strive by your own bright and cheery conversation to keep him from worrying about his troubles. Do not allow recitals of the ills of others or disturbing tales of any kind. Converse in natural quiet tones and avoid the whispers which arouse the curiosity and suspicion of the patient. Remember that a word of praise for the fight already made and cheery and hopeful encouragement for the future are quite as necessary for the mind as the medicine is for the body.

Prevent the Spread of Disease From the Sick Room: It is important for those in charge of the sick room to know the ways in which the germs of our common diseases are spread, and the precautions which should be taken to prevent it.

It is wise to avoid needless exposure to infection. The sick room should not become a meeting place or a lounging room for friends and visitors.

Provide a separate set of dishes for the patient, and wash them apart from those used by the other members of the family.

Take great care in disposing of the wastes from the sick room. They should be promptly removed and treated with powerful germ-killing substances or completely destroyed to prevent them from spreading the disease.

In all contagious diseases the rules of *quarantine* should be strictly enforced. All persons except those actually caring for the patient should be kept out of the sick room until all danger of "catching" the disease is past. It is equally important for those who care for the patient to be careful not to carry the disease out of the sick room with them. Quarantine regulations often require the nurse to remain within the sick room throughout the whole course of the disease. It would be interesting to look up your own quarantine rules in this respect.

After the Illness Is Over:

After the illness is over, care must be taken to prevent the spread of disease from the germs which may still remain in the sick room. This is especially important in all contagious diseases.

Make liberal use of disinfectants in cleaning and scrubbing. Carry everything that is possible out into the sunlight, for this is one of the most powerful disinfectants we can use. Then, in order to be certain that all germs are killed, the room should be tightly closed and a powerful germ-killing substance sprinkled or burned within it according to the directions for the purpose. Air the room thoroughly before returning it to its regular use.

Helpful Things to Do

1. Look up the names of substances that can be used in the cleaning water for the sick room; also,

for disinfecting the sick room after the illness is over. Discuss the directions given for the use of each of them.

Questions and Health Problems For Discussion

1. Why is quiet so necessary for a sick room?

2. Describe the things to do in preparing a room for a patient.

3. How should the soiled clothing from the sick room be cared for?

4. What is the value of cheerfulness in the sick room?

5. What precautions should be taken to prevent the spread of disease from the sick room? Why is this so necessary in cases of contagious diseases?

6. How may the sick room be disinfected after the illness is over? Why is this necessary?

7. What lessons can be learned from the management of a hospital that will be helpful in caring for a sick room in the home?

CHAPTER XXIX

FIRST AID

Accidents do happen now and then in spite of all our carefulness. Some are very trifling while others are much more serious. In many of them, part of the suffering can be relieved and even life itself saved by prompt action of some one who knows what to do until the doctor comes.

Keep Calm and Cool:

Some of us do not know exactly how we should act in a sudden emergency, but we should remember that we shall be worth a great deal more if we remain calm and keep our wits about us. Excitement causes the loss of valuable time, and there are some emergencies in which even seconds may mean the difference between life and death.

Know What to Do and How to Do It:

These two things go together in first aid work. Our knowledge may be of little value in an emergency unless we know how to apply it, or put it into use. We may know that artificial breathing should be used in cases of suffocation, but unless we know how to compress and relax the chest in imitation of natural breathing, our knowledge does not go far enough to save a life.

Many of the things done in first aid work can be practiced upon persons who pretend to be injured in various ways. First aid classes are often formed for just these purposes. The actual experiences gained makes the book knowledge much more valuable. Suggestions for the formation of such classes and materials to be used in them can be obtained from the American Red Cross.

First Aid in Choking:

Choking is one of the commonest accidents requiring prompt first aid treatment. Slapping on the back stimulates coughing which will often force out the obstruction. When a baby chokes, hold its head downward and slap it on the back. If care is taken not to push the object farther into the windpipe, the tip of a finger should be inserted and the foreign body drawn out.

First Aid in Fainting:

Fainting results from a sudden lessening of the blood supply in the brain. The treatment consists in increasing the amount of blood in this part of the body. Place the patient flat on the back with the head slightly lower than the feet. In no case should the head be propped up on a pillow. Apply cold, wet cloths to the face and neck. Open the clothing about the neck to allow a free and easy circulation of the blood to the head. The application of smelling salts

to the nostrils will stimulate the breathing and help to restore consciousness.

In fainting, as well as in all emergencies, it is helpful to get the patient away from a crowd or to pre-

A First Aid Class. It is best when each gets a turn to handle the case.

vent the people from pressing in too close. This reduces the amount of excitement and allows a freer circulation of air about the patient.

Cuts and Wounds:

These include all injuries in which the skin is pierced or cut. Some are so slight that we treat them ourselves without calling upon the services of a physician. Others need prompt medical attention.

All cuts and wounds, no matter how slight, should be promptly sterilized to prevent infection by germs. Use iodine or other suitable substance for this pur-

pose. Keep out the dirt. Do this by a loose bandage which will allow the air to reach the cut, rather than close it tightly with adhesive, or court plaster.

Another source of danger is from bleeding. Unless a large blood vessel is cut, the natural clotting of the blood will usually check its flow. When large blood vessels are cut, first aid treatment must be given to prevent the loss of too much blood. You will remember from our study of the blood and its circulation that bleeding from arteries is bright red, and occurs in spurts, or jets, while the blood from veins is darker red in color and flows in a steady stream. To check bleeding from arteries, a tight band should be fastened or pressure applied over the artery between the wound and the heart. In bleeding from veins this pressure needs to be applied on the side of the wound away from the heart because the blood in veins is flowing back to the heart. Bandage the wound tightly. This will bring the edges together and help to check the bleeding.

First Aid in Drowning:

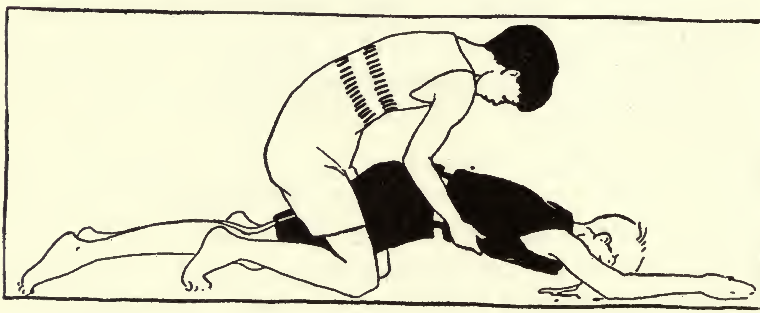
In cases of drowning, the lungs are filled with water instead of air. This stops the breathing and interferes with the action of the heart as well. The first efforts therefore are to get the water out of the lungs and to start up the process of breathing again.

Turn the patient face downward. Place your hands under his abdomen and lift him up so that the

water in the lungs will run out of the nose and mouth. Then begin the work of artificial respiration at once.

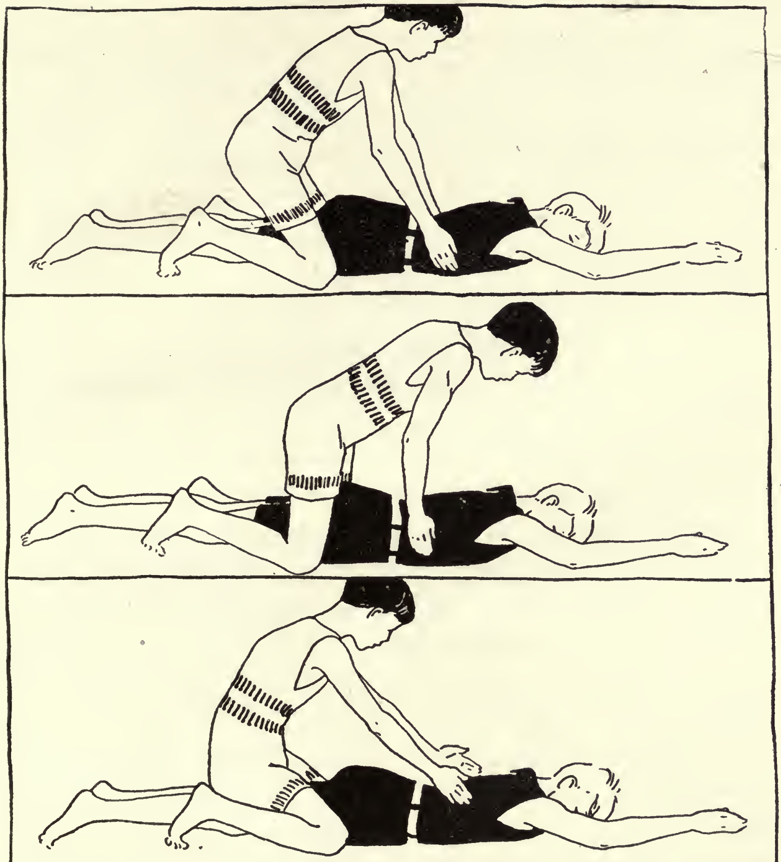
In artificial respiration, lay the patient on his stomach with the arms extended straight forward. Keep his face turned on the side so that the nose and mouth will be free for breathing. Kneel, facing the patient's head, with one knee on each side of his body without resting your weight upon it. Place the palms

"Shaefer Method" of Artificial Respiration



First—Empty the water from the lungs.

of your hands upon the short ribs across the small of the back with the thumbs nearly together as shown in the illustration on page 381. Then with the arms held straight, swing slowly forward so that the weight of your body is gradually pressed down upon the patient. This decreases the size of his chest cavity and forces the air out of his lungs. Then swing back to remove the pressure, and



One—Place the hands upon the lower ribs.

Two—Swing slowly forward to bring the weight upon the patient's ribs.

Three—Swing back to the resting position. Do not hurry. Use a watch. Keep steadily at it for an hour or so, if necessary, at the rate of 12 to 15 complete inspirations and expirations per minute.

the chest expands to its former size and draws air into the lungs. Keep this up steadily for an hour or more if necessary, at the rate of twelve to fifteen complete respirations each minute. Use a watch if one can be obtained. Do not make the mistake of going through the motions too fast. Time must be allowed for the lungs to fill with air before it is pressed out again. This is the so-called "Shaefer Method" of artificial respiration.

At the same time that the artificial respiration is going on, other persons should remove the wet clothing and cover the patient with dry clothing and blankets and place hot water bottles at his feet to keep him warm. Rubbing the legs and arms toward the body will also help in starting up the circulation again. Then, after the patient has been restored to consciousness, he should be put to bed and covered with warmed blankets or surrounded with hot water bottles.

All persons should know how to swim. Swimming is a most valuable form of exercise. It affords much pleasure and enjoyment, and may save your own life or the life of another.

Burns:

Burns are painful injuries which damage the skin and tissues beneath it. The pain can be relieved a little before the doctor comes by covering the burn with baking soda, vaseline, glycerine, olive, or salad

oil, or by plunging the part into cool water, in order to keep the air from it. Do not put bandages, or coverings, on a burn in such a way that they will stick to it and cause greater pain and injury in removing them.

When the clothing catches fire, try to remember to lie down and roll over and over or wrap up in a blanket, rug, or coat to smother the flames. Do not run, as this only fans the flames and makes them burn faster. Lying down also prevents the flames from leaping upward and burning the face.

Poisons:

When poisons have been swallowed, we must think and act quickly. Prompt first aid treatment with ordinary household substances will often save a life while waiting for the doctor.

In all except strong acid and alkali poisons, work first to get the patient to vomit. This empties the stomach and lessens the amount of the poison which is being absorbed into the blood stream. Substances which cause vomiting are called *emetics*. One of the best is made by mixing mustard in luke warm water in the proportion of a teaspoonful to a glass of water. Use salt and warm water if no mustard can be found, or even warm water alone. Keep the patient drinking the emetic until vomiting results. Do not waste valuable time in waiting for someone to go out and get these substances if they are not at hand, for

vomiting can often be produced by tickling the back of the throat with the end of the finger.

Vomiting should not be produced when strong alkalies and acids have been swallowed. It should be remembered in such cases that alkalies and acids neutralize each other or make each other harmless. Therefore, in case of poisoning from *alkalies,* like lye, lime, or ammonia, give the patient doses of mild acids, like vinegar, or juice of lemons and oranges. Then in case of poisoning by *strong acids,* like sulphuric acid or hydrochloric acid, give the patient doses of mild alkalies like lime water, magnesia, baking soda, or even soap, or ground up plaster from the walls.

Then remember that it is helpful to give large quantities of the whites of eggs in poisoning of all kinds. Mix the whites of several eggs in water and force the patient to drink as much as possible.

In addition to these general remedies there are other substances which help to offset the dangerous effects of certain poisons and are called their antidotes. A list of common poisons and their antidotes is printed on the next page for purposes of reference.

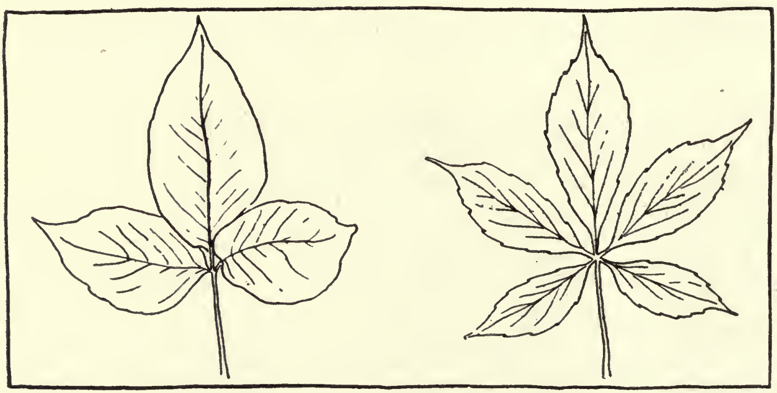
Keep bottles containing poisons plainly labeled and out of reach of little children. A piece of sand paper tied around a poison bottle will prevent a mistaken use of its contents in the dark.

POISON	TREATMENT		
Acids: Hydrochloric, Sulphuric, Nitric	Whites of Eggs	....	Strong lime water, baking soda, magnesia, soap, or plaster from walls.
Alkalies: Lye, Lime, Ammonia	Whites of Eggs	....	Vinegar, lemon, and orange juice, milk.
Alcohol: Whiskey, Toilet Waters, Bay Rum	Whites of Eggs	Emetic	Strong coffee, water.
Camphor: Napthaline, Flake Camphor, Camphor Balls	Whites of Eggs	Emetic	Strong coffee, warmth.
Carbolic Acid	Whites of Eggs	....	Epson salts, whiskey, water.
Carbona	Whites of Eggs	Emetic	Strong coffee, whiskey.
Gasoline	Whites of Eggs	Emetic	Strong coffee.
Iodine	Whites of Eggs	....	Cornstarch and water or milk.
Lead Poisoning: Paint	Whites of Eggs	Emetic	Epson salts.
Soothing Syrup: Morphine	....	Emetic	Strong coffee, keep awake, artificial respiration.
Tobacco	....	....	Strong coffee.
Turpentine	Whites of Eggs	Emetic	Strong coffee, lots of water, keep awake.

Ivy Poisoning:

The poison ivy is a very common plant in many places. It grows along roadways, covers fence posts, and winds itself about trees and stumps. It is quite easy to tell the poison variety from the harmless kinds. Poison ivy has *three* shining leaves and yellowish green berries while the harmless ivy has *five* leaves and red berries.

The poisoning effects from this plant are due to an oil which rubs off its leaves on to the skin. Therefore wash the skin thoroughly with soap and water



The shiny leaves of the poison ivy are arranged in groups of three. Its berries are yellowish-green.

The ivy with leaves in groups of five is not poisonous. Its berries are red.

just as soon as possible. This will prevent the poison from getting a start in many cases.

Bandaging:

Bandages are often needed in first aid work to keep dirt out of cuts and wounds, to stop bleeding by pressure, to keep dressings in place, and to serve as slings.

The best all round bandage for first aid purposes is a triangular one. It is easily made from muslin or other strong material and bed sheets, pillow cases, handkerchiefs, napkins, or even articles of clothing can be used to make it. Cut a large square of such material diagonally across, and it will make two triangular bandages. It then can be applied folded or unfolded as needed. Tie the ends securely but not so tight that it will interfere with the circulation of the blood, except in cases where it is used to stop bleeding.

The roller bandage is harder for an inexperienced person to use than the triangular bandage but serves the purpose just as well when it is used.

Bandages should be made from clean materials, and it is important to sterilize them before applying them next to an open wound. Such bandages can be sterilized in a double boiler. Put the bandage in the top part and boil. The heat kills all the germs and makes the bandage safe to use.

Helpful Things to Do

Organize a First Aid class or club. Practice the first aid work in as many pretended emergencies as possible. Be sure to include fainting, drowning and suffocation, burns, choking, cuts and wounds, broken bones, nose bleed, and bandaging.

2. Look up and make a list of substances that can be used to sterilize cuts and wounds. Which of them are to be found in your medicine closet?

3. Copy the treatment of common poisons and post it inside your medicine closet.

Questions and Health Problems For Discussion

1. What is meant by "First Aid"?

2. Why is it so necessary to keep calm and cool in emergencies?

3. Describe the first aid in choking.

4. What causes fainting? How should it be treated?

5. Why should cuts and wounds be sterilized immediately? What substances can be used for this purpose?

6. What would you do to stop bleeding from arteries? From veins?

7. Describe the procedure to follow in artificial respiration.

8. How can the pain of burns be relieved?

9. Why will rolling up in a blanket smother and extinguish the flames when clothing catches fire? Why is it wrong to run at such a time?

10. What is the first thing to do when poisons are swallowed? What comes next? What more can be done until the doctor arrives?

11. How should poison bottles be marked to prevent their use by mistake?

12. Describe the differences between poison ivy and the harmless varieties of ivy.

13. How can ivy poisoning be prevented?

14. What form of bandage is easiest for an inexperienced person to use in first aid work? How is it made? From what common materials around the house can it be made?

CHAPTER XXX

Useful Information

for

Boys and Girls, Their Teachers, and Their Parents

Contents

The School Doctor and the School Nurse

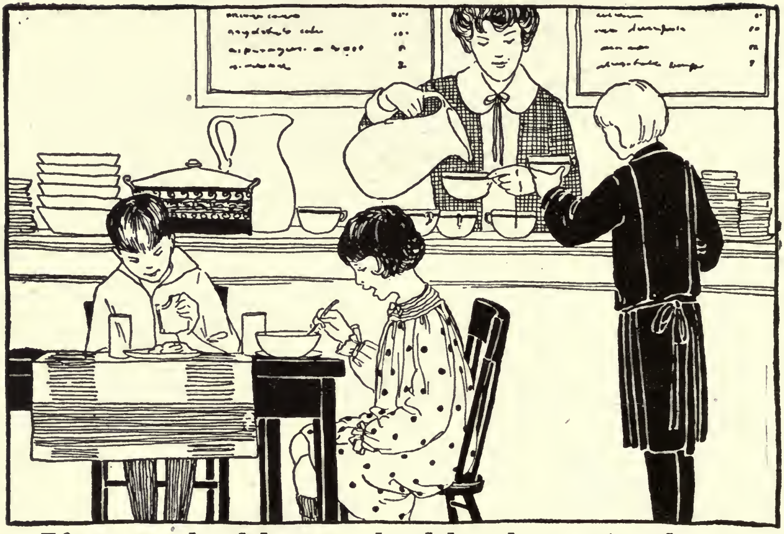
Many schools, especially those in cities, have school doctors and school nurses to help the boys and girls, and to make friendly suggestions to improve their health.

Remember, they are your good friends—they are trying to help you.

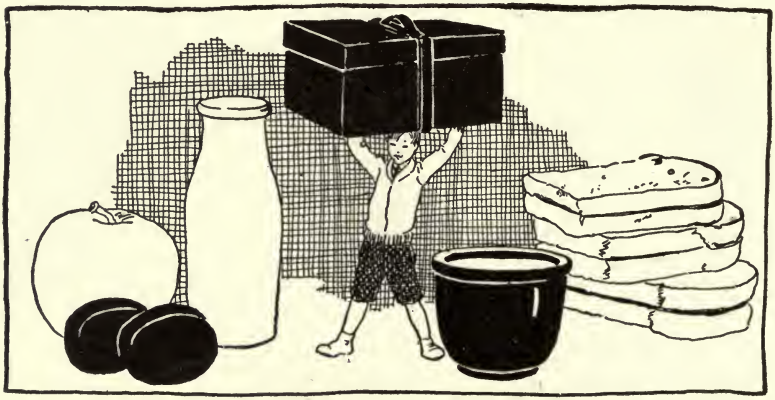
Generally they give a medical examination to each boy and girl at least once a year. If they find anything about you that needs attention, anything that should be fixed, have it attended to right away.

Remember—two of your good friends—the school doctor and the school nurse.

THE SCHOOL LUNCH



If your school has a school lunch counter, be sure to use it. There you will get the best of food to keep you strong and healthy. Name some of the good foods that you can buy at your school lunch. If your school has no lunch counter, how can it get one?



A Quart of Tooth Powder for a Quarter!

"If you secure a clean, dry Mason jar, quart size, nearly any druggist will put up the following formula for a tooth powder, for 25 cents. Do not use it immediately but shake it thoroughly, now and then, for the first twenty-four hours. This will mix the powders and permit the oils to have sufficient time to permeate all of the ingredients.

"When using, place some of the powder in a small, wide mouth bottle and then shake some of the powder onto the tooth brush that has previously been thoroughly wet. Keep the bottle and the Mason jar tightly closed.

"Formula for Tooth Powder

Finest grade English precipitated chalk.	½ pound
Powdered Castile soap................	1¾ ounces
Light carbonate of magnesia...........	1/3 ounce
Oil of clove	46 drops
Oil of wintergreen	35 drops
Oil of sassafras	35 drops
Oil of peppermint	18 drops
Saccharine—finely powdered	4 grs."

Extract from directions on Care of the Teeth, issued by City Board of Health, Bridgeport, Connecticut.

How to Make Lime Water

(For use as a tooth wash)

Five cents worth of coarse, unslaked lime, such as the masons use for coarse plaster, will keep a whole family supplied with the best kind of a mouth wash for a whole year. The refined lime that the druggist sells does not seem to have the same solvent action. Perhaps the refining process robs it of some of its virtues.

Secure from a paint store a lump of coarse lime and crush it into a fine powder. Place a half cupful into an empty quart bottle and fill nearly full with cold water. Thoroughly shake and then allow the lime to settle to the bottom of the bottle, which will take several hours. After it has settled pour down the sink as much of the clear water as you can without losing any of the lime, as this first mixing contains the washing of the lime. Again fill with cold water, shake well, and allow it again to settle.

Into an empty twelve ounce bottle pour the clear lime water, taking care not to stir up the lime in the bottom of the bottle; now place the quart bottle under the faucet and fill with cold water, shake thoroughly, and set it aside to use when the smaller bottle becomes empty. This process may be repeated until the half cup of lime has made five or six quarts of mouth wash.

The twelve ounce bottle is used as it is more easily handled at the wash bowl. After brushing and flossing the teeth, pour out a little of the lime water into a glass, and taking it into the mouth, force it back and forth between the teeth with the tongue and cheeks

until it foams. If you rinse it long enough to make it foam it has then been in the mouth long enough to have a beneficial action on the teeth. After spitting it out rinse the mouth with clear water to take away the taste of the lime. If the lime water is a little strong at first, dilute it with clear water in the small bottle, half and half. It should be used clear and full strength as soon as the gums become hard and healthy from brushing.

Extract from directions on Care of the Teeth, issued by City Board of Health, Bridgeport, Connecticut.

Setting-Up Exercises

It is believed by experts in the field of physical education that the best results are obtained from setting-up exercises when they are prescribed by an expert, and are varied to suit the age and physical condition of each individual. For schools where that is possible, the following exercises will not be necessary. For schools where such advice is not possible, the following setting-up exercises have been arranged to meet the needs of normal children in the intermediate grades.

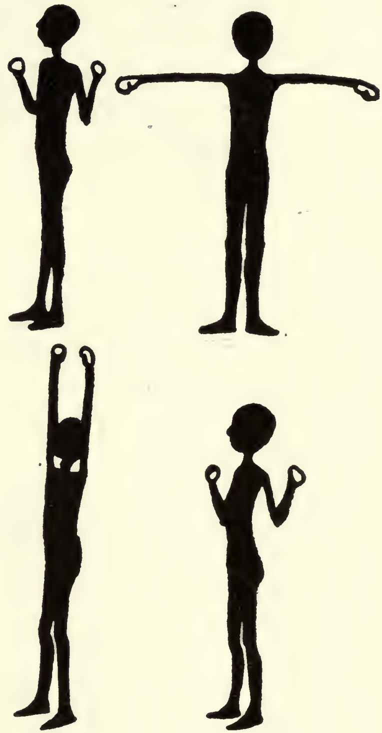
(Compiled and arranged by Mr. D. Willard Zahn, B. A., Principal, James Lynd Public School, Formerly Instructor in Physical Training, Philadelphia Normal School, Philadelphia, Pennsylvania)

NOTE: The number of times each exercise is to be performed is optional with the teacher, as this element should vary with the particular needs or the given conditions in any class. For the guidance of the teacher, however, a rough indication of the number of repetitions is made at the end of each exercise.

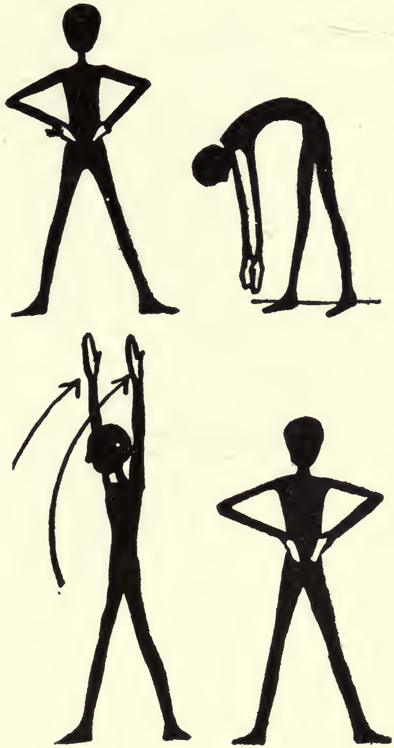
Setting Up Exercises for Lower Intermediate Grades

Exercises

CIRCULATION EXERCISES: (a) Arms: Arms to thrust — Bend! Thrust arms sideward-1; Return-2; Upward-3; Return-4. (Complete movement about 4 times.)

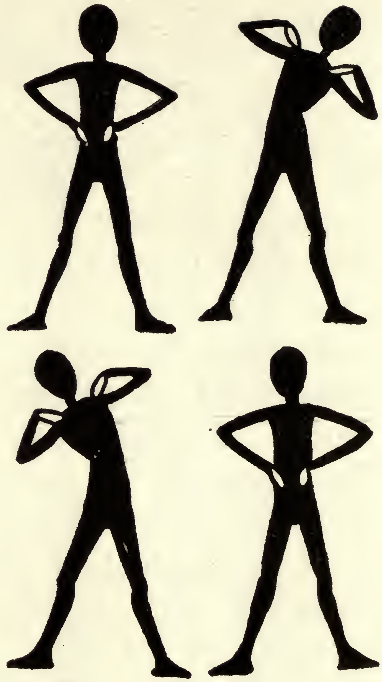


(b) Legs: Hands on Hips, Place! Alternately and quickly raise left and right knee forward, 1, 2; 1, 2; etc. (Complete movement about 10 times.)



TRUNK EXERCISES: (a) Front-Back; Place hands on hips and to a side stride-Jump! Bend trunk fore-downward and straighten arms downward-1, straighten trunk and swing arms fore-upward-2, Place hands on hips-3. (Complete movement about 4 times.)

(b) Sideward: (Remain in side stride.) Place hands on shoulders and bend trunk left-1, Bend trunk to the right-2. Continue this swaying movement through count of 8. On count of 9 straighten trunk and replace hands on hips.



Position (feet together)-Jump!

BALANCE EXERCISES: (Keep hands on hips.) Straighten left leg backward-1, Return-2; Right leg-3, Return-4.

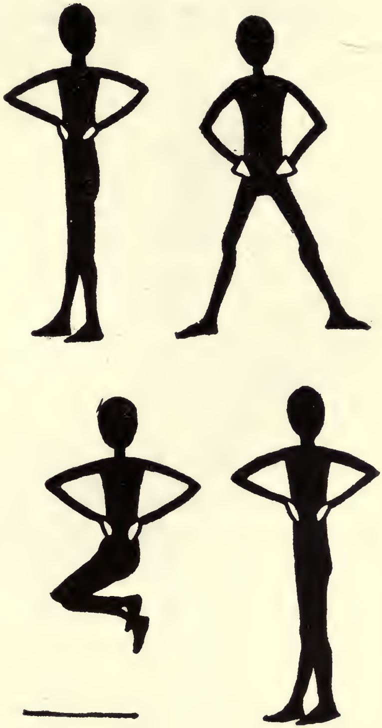
(About 4 complete movements.)

JUMPING EXERCISES: (a) Hands on hips-Place! Jump to side stride-1, Return-2.

(or)

(b) Hands on hips-Place! *In Place*-Jump, 1, 2; 1, 2; etc.

(Either jump about 8 counts.)



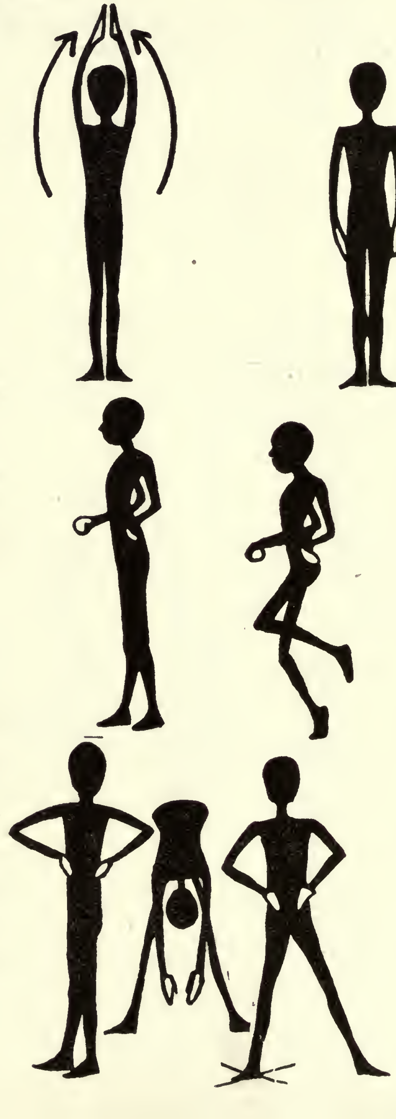
Setting Up Exercises for Lower Intermediate Grades

EXERCISES

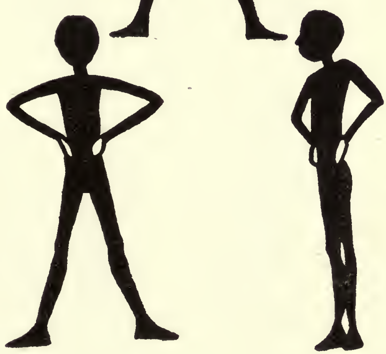
CIRCULATION EXERCISES: (a) Arms: Raise arms side upward, clapping hands over head-1, Return striking thighs-2. (About 8 times.)

(b) Legs: Arms for running-Bend! *In place*-Run! (Vigorous, and to a definitely established rhythm.) (Count to 30 or 50.)

TRUNK EXERCISES: (a) Front-Back: Hands on hips-Place! Stride left sideward-1, bend trunk fore-downward and straighten arms downward-2; reverse-3, return-4. (In alternation left and right.) (Twice in each direction.)



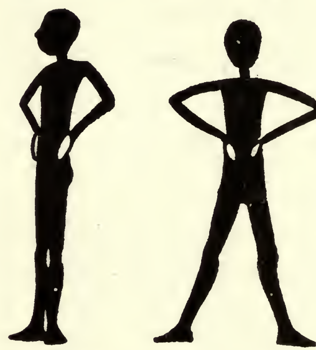
(b) Sideward: Straighten arms sideward (palms up), and to a side stride-Jump! Bend trunk left-1, right-2. Continue this swaying movement to count of 8, and straighten trunk swinging hands to hips on count of 9.



Position (feet together)-Jump!

BALANCE EXERCISES: (Hands still on hips): Left leg backward and arms sideward (palms up)-Raise! Lower! Same right-Raise! Lower! (About 4 complete movements.)

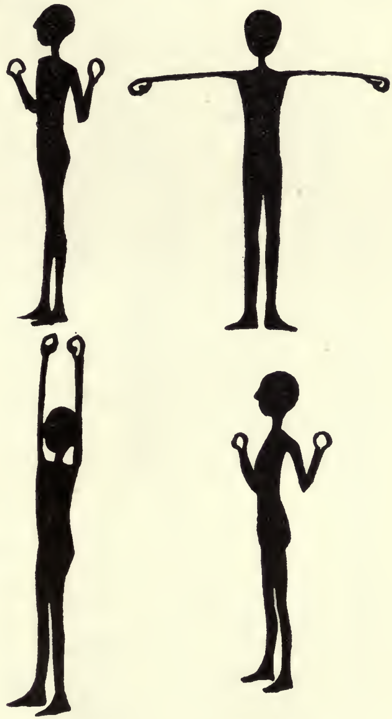
JUMPING EXERCISES: Hands on hips-Place! Jump to side stride-1, return-2. Jump to a side-stride-3, return-4; and 4 jumps in place, 5-6-7-8.



Setting Up Exercises for Upper Intermediate Grades

Exercises

CIRCULATION EXERCISES: (a) Arms: Arms to thrust-Bend! Thrust arms sideward-1, return-2; upward-3, return-4. (About 6 times.)



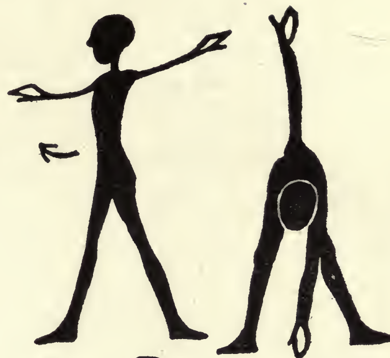
(b) Legs: Arms for running-Bend! In place raising knees high in front-Run! (Count to 50, or to 100.)

TRUNK EXERCISES: (a) Front-back: Lunge left sideward and bend arms to thrust-1, bend trunk fore-downward and thrust arms downward-2; reverse-3, return-4.

Same exercise to right; (later in alternation). (About four complete movements.)

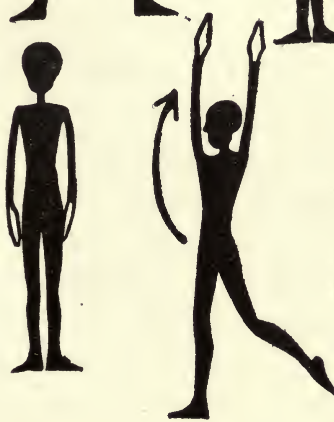
(b) Sideward: Raise arms sideward and to a side stride-Jump! Turn trunk left-1, bend trunk right sideward-2; raise trunk-3, turn trunk all the way around to the right-4; bend trunk left sideward-5; straighten trunk-6.

(Note: *The first four figures on page 405 are following directions given on page 404 (b).*)



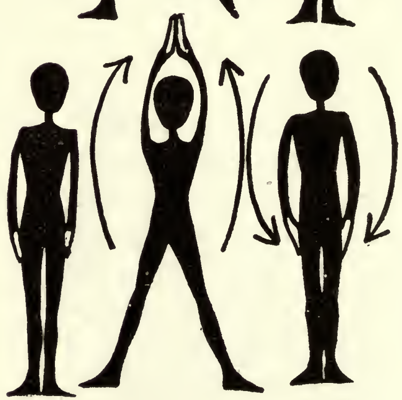
(About three complete movements.) Position (feet together)-Jump!

BALANCE EXERCISES: (Arms at side.) Swing arms fore-upward and raise left leg backward-1, lower arms sideward (palms up)-2; reverse-3, return-4. (About 3 complete movements.)



(Note: *The first three figures on page 406 are following directions given on page 405*).

JUMPING EXERCISES: Jump to a side stride and raise arms side upward clapping hands over head-1, return striking thighs-2. (Count of 16.)



HOW FAST CAN YOU RUN? HOW FAR CAN YOU JUMP OR THROW?

This table shows the average performance, in various sports, for boys and girls at different ages. The lower figures (in parenthesis), in each case, show very good records for the age.

Age Aims in Sports for Boys and Girls*

EVENTS		YEARS 8	9	10	11	12	13	14	15
Running 50 Yards (In seconds and tenths)	GIRLS	9.4 (9.0)	9.2 (8.8)	8.8 (8.4)	8.6 (8.2)	8.4 (8.0)	8.4 (8.0)	8.4 (7.8)	8.2 (7.6)
	BOYS	9.0 (8.8)	8.8 (8.6)	8.4 (8.2)	8.2 (8.0)	8.0 (7.6)	7.8 (7.6)	7.6 (7.2)	7.4 (7.0)
Running 60 Yards (In seconds and tenths)	GIRLS	12.6 (10.0)	12.4 (9.8)	11.6 (9.2)	11.0 (9.0)	10.8 (8.6)	10.8 (8.2)	10.8 (8.6)	11.0 (9.4)
	BOYS	11.8 (9.4)	11.4 (9.2)	10.8 (9.0)	10.4 (8.8)	10.0 (8.2)	9.8 (8.0)	9.4 (7.6)	9.0 (7.6)
Running 75 Yards (In seconds and tenths)	GIRLS	15.4 (12.4)	14.6 (11.0)	14.2 (10.4)	13.8 (10.2)	13.6 (10.2)	13.4 (10.4)	14.0 (11.0)	14.4 (11.8)
	BOYS	14.1 (11.6)	13.6 (10.8)	13.2 (9.8)	12.6 (9.8)	12.2 (9.6)	11.8 (8.8)	11.4 (8.4)	11.0 (8.0)
Running 100 Yards (In seconds and tenths)	GIRLS	19.2 (18.0)	18.6 (16.8)	17.2 (15.8)	16.8 (15.6)	16.6 (15.6)	16.4 (15.4)	16.2 (15.4)	16.2 (15.2)
	BOYS	19.2 (18.0)	18.6 (16.8)	17.2 (15.8)	16.2 (15.2)	15.4 (15.0)	15.0 (14.4)	14.2 (13.6)	13.4 (13.0)
Standing Broad Jump (In feet and inches)	GIRLS	3.0 (4.4)	3.1 (4.6)	3.3 (4.9)	3.6 (5.0)	3.8 (5.3)	3.10 (5.6)	4.0 (6.0)	4.1 (6.0)
	BOYS	3.4 (4.4)	3.8 (4.10)	4.0 (5.4)	4.3 (5.10)	4.6 (6.3)	4.9 (6.6)	5.2 (6.10)	5.5 (7.4)
Running Broad Jump (In feet and inches)	GIRLS	5.5 (6.0)	5.6 (6.2)	5.10 (6.8)	6.6 (7.8)	7.2 (8.4)	8.0 (9.0)	9.0 (10.8)	9.0 (11.8)
	BOYS	6.0 (6.9)	6.6 (7.0)	7.0 (7.6)	8.3 (9.1)	9.6 (10.8)	11.4 (12.2)	12.6 (13.5)	13.5 (14.7)
Triple Standing Broad Jump (In feet and inches)	GIRLS	10.4 (12.0)	10.6 (12.6)	10.10 (14.2)	12.1 (14.8)	12.5 (15.8)	12.9 (17.0)	13.0 (17.0)	13.10 (17.7)
	BOYS	12.0 (14.3)	12.3 (14.8)	13.0 (15.9)	14.0 (16.9)	14.6 (18.7)	15.1 (19.0)	16.4 (20.7)	18.1 (22.4)
Running Hop, Step and Jump (In feet and inches)	GIRLS (10 foot start)	9.2 (11.0)	11.6 (13.9)	13.8 (17.0)	14.6 (18.8)	15.5 (21.4)	15.6 (21.0)	16.4 (21.2)	16.6 (20.0)
	BOYS (unlimited run)	10.0 (10.6)	13.0 (15.5)	16.4 (20.5)	18.0 (23.0)	18.8 (24.5)	19.9 (26.0)	21.7 (29.0)	23.0 (29.5)
Running High Jump (In feet and inches)	GIRLS	2.2 (2.6)	2.5 (2.8)	2.8 (2.10)	2.9 (3.0)	2.10 (3.2)	3.2 (3.3)	2.11 (3.1)	2.9 (3.1)
	BOYS	2.2 (2.8)	2.5 (2.10)	2.8 (3.2)	2.11 (3.4)	3.1 (3.6)	3.4 (3.9)	3.6 (4.2)	3.9 (4.5)
Basket Ball Overhead Far Throw (In feet and inches)	GIRLS	12.2 (17.0)	13.8 (20.0)	15.5 (25.0)	17.7 (28.0)	19.4 (31.0)	21.3 (35.0)	22.2 (35.0)	23.4 (36.0)
	BOYS	14.4 (19.0)	16.2 (22.0)	18.2 (26.0)	20.3 (30.0)	23.3 (35.6)	24.1 (37.0)	26.7 (37.6)	29.1 (39.0)
Basket Ball Round Arm Far Throw (In feet and inches)	GIRLS (one step permitted)	13.4 (25.0)	15.1 (31.0)	17.0 (36.0)	19.3 (38.0)	22.2 (42.0)	25.4 (53.0)	27.8 (55.0)	30.0 (57.0)
	BOYS (one step permitted)	18.5 (36.0)	22.3 (44.0)	25.6 (47.0)	28.7 (53.0)	32.9 (60.0)	36.9 (70.0)	41.5 (73.0)	46.8 (73.0)
Indoor Base Ball Far Throw (In feet and inches)	GIRLS (unlimited run)	23.0 (45.0)	25.9 (56.0)	30.6 (60.0)	35.0 (68.0)	43.0 (80.0)	48.9 (87.0)	53.0 (106.0)	53.5 (102.0)
	BOYS (unlimited run)	37.7 (71.0)	47.4 (86.0)	57.2 (104.0)	67.0 (113.0)	77.2 (120.0)	88.0 (141.0)	102.1 (151.0)	108.1 (187.0)

*Courtesy Mr. William A. Stecher, Director of Physical Education, Philadelphia Public Schools

Note: These Age-Aims are in use in the public schools of Philadelphia, and are included merely to show what the boys and girls in that city have done. They are not recommended as standard for those schools or school systems that may have established their own standards. For places where no age-aim standards exist, they may be used for purposes of comparative performance.

Further interesting information regarding physical efficiency tests can be secured from The Playground and Recreation Association of America (New York City).

Foods Suitable for Children of Intermediate Grades*

Breakfast

Fruits:

Oranges; cooked prunes; apricots; apples; figs; peaches; pears; bananas; pineapple; plums; grapes (seeds removed); raisins (cooked), all fresh fruits in season when thoroughly ripe, cooked or uncooked.

Cereals:

Oatmeal; corn meal; samp; hominy; rice; farina; wheatina; cream of wheat; corn flakes; graham flour; barley. Stewed chopped dates and prunes may be added to white cereals to give variety.

Bread:

Whole grained breads served as toast, zwiebach or stale brown, corn, graham, or rye breads.

Beverages:

Milk (not cold); cocoa (made with milk).

Miscellaneous:

Eggs; bacon; baked potatoes.

Dinner (preferably at noon)

After eight years the child may have evening dinner with the family. In this case such differences in the child's meal will have to be made as are necessary to meet his dietary requirements.

Soups:

Cream; cereal; vegetable.

Meats:

Lean lamb; mutton; beef; fish; cod; halibut; haddock; oysters; fowl; bacon (broiled). Other meats to be baked, roasted or stewed. One or two ounces three or four times per week is sufficient. Milk, eggs, cereals and vegetables are more necessary for children.

Vegetables:

Potatoes, baked or boiled, *not fried.* Onions, squash, cauliflower, asparagus; celery, cooked or fresh; dried and fresh peas and beans; spinach; carrots; parsnips; oyster plant; turnips; beet tops; turnip tops; dandelions; chard; lettuce;

tomatoes (cooked); young beets; sweet potatoes; Brussels sprouts; lentils.

Miscellaneous:

Macaroni; spaghetti; cottage cheese; American cheese, when melted in combination with other foods; eggs; molasses; sugar; honey.

Desserts:

Plain nutritious puddings; plain cake; fruits; ginger-bread; home made ice cream and ices; simple candies.

Supper

Soups:

Cream; cereal, vegetable, puree soups.

Vegetables:

Spinach; rice; white potatoes (baked or creamed); puree of peas or beans; green leafy vegetables such as beet and turnip-tops; dandelions.

Miscellaneous:

Bread and milk—as separate dishes or combined, as milk toast. Cottage cheese, cereals, eggs.

Beverages:

Milk, milk flavored with cocoa.

Desserts:

Plain puddings; such as prune, rice, blancmanges, milk and egg custards; ginger cookies; stale plain cake; junket; cooked fruits.

**From Appendix N, Pages 145-149, Pennsylvania State Course of Study in School Health. Used with permission.*

Notes on Selection of Foods

Whole wheat bread is better for growing children than rye bread.

Fish may be used at any meal instead of meat.

Fresh vegetables are better than dried or canned vegetables.

Eggs may be used four or five times a week, and may be used instead of meat.

Milk, vegetables, and cereals are more necessary than meat.

Orange juice and crackers may be used for the mid-morning lunch. Orange juice may also be used as a beverage.

Grape nuts may be used in warm weather, instead of cream of wheat.

Brown rice is better than the white rice.

"Clear" or "thin" soups do not contain much nourishment for children.

Buttermilk is a good beverage. Milk or orange juice is better than cocoa.

A salad (lettuce with fruit or vegetables), plain lettuce, or celery may be served with any dinner or supper.

The amount you should eat depends upon

1—your age:
  Older children should eat more than younger children.

2—your weight:
  If you are underweight, it may be that you need more food, or better balanced meals.

  If you are overweight, it may be that you need less food, or better balanced meals.

Young children should eat less meat, and should drink more milk instead. Cottage cheese should be home-made, or of the best grade when bought at the store. Use it only when fresh.

MEASURING SCALE

Weight in relation to age, height, and physical type

(Based Upon the Tables of Bird T. Baldwin, Ph.D.)

INSTRUCTIONS FOR USE OF CHART

Before the pupil is measured, it should be determined by careful observation to which physical type he belongs. In case of doubt it may be helpful to note that the Nordic races (Central and Northwestern Europe) are usually of the tall slender type; the Southern European or Mediterranean races are usually of the short stocky type.

The pupil's height in inches should be taken against the scale of the type to which he belongs. A right-angled triangle or square placed against the wall and on top of the pupil's head should be used to secure accuracy.

The following illustrations will serve to interpret the scale:—

A 15-year-old girl of the average type, 63 inches tall. She is of normal weight if she weighs 116 pounds; she would be considered underweight if she weighed under 104 pounds; and overweight if she weighed over 139 pounds.

A 14-year-old boy of the tall slender type, 67 inches tall. He is of normal weight if he weighs 128 pounds; he would be considered underweight if he weighed under 115 pounds; and overweight if he weighed over 153 pounds.

BOYS

TALL SLENDER TYPE					AVERAGE TYPE					SHORT STOCKY TYPE				
HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)
74	154	205	171	19										
	153	204	170	18										
	151	201	168	17										
	148	197	164	16										
73	150	200	167	19										
	148	197	164	18										
	146	194	162	17										
	144	192	160	16										
72	147	195	163	19										
	142	189	158	18										
	140	187	156	17										
	140	187	155	16										
	138	183	153	15										
71	137	182	152	17										
	136	181	151	16	71	143	191	159	19					
	135	180	150	15		139	185	154	18					

BOYS—Continued

TALL SLENDER TYPE					AVERAGE TYPE					SHORT STOCKY TYPE				
HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.)			AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.)			AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.)			AGE (Yrs.)
	Underweight Under	Overweight Over	Normal Weight			Underweight Under	Overweight Over	Normal Weight			Underweight Under	Overweight Over	Normal Weight	
70	133 130 130 129	177 174 173 172	148 145 144 143	17 16 15 14	70	140 135	187 180	155 150	19 18					
69	125 125	167 167	139 139	15 14	69	137 134 131 129	182 179 175 172	152 149 146 143	19 18 17 16					
68	121 121	161 161	134 134	15 14	68	132 129 127 123	176 172 169 164	147 143 141 137	19 18 17 16					
67	115	153	128	14	67	122 121 117	163 161 156	136 134 130	17 16 15	67	128 125	170 167	142 139	19 18
66	110 107 107	146 143 143	122 119 119	14 13 12	66	119 115 112	158 153 150	132 128 125	17 16 15	66	125 122	167 163	139 136	19 18

65	105	140	117	13	**65**	110 108 106	146 144 142	122 120 118	16 15 14	**65**	121 118 115	161 157 152	134 131 127	19 18 17
64	100 98	133 131	111 109	13 12	**64**	103 102	138 136	115 113	15 14	**64**	117 113 109 105	156 151 145 140	130 126 121 117	19 18 17 16
63	96 95	128 127	107 106	13 12	**63**	99 97	132 130	110 108	15 14	**63**	115 111 106 102	152 148 142 136	127 123 118 113	19 18 17 16
62	91	121	101	12	**62**	93 92	123 122	103 102	14 13	**62**	100 96 94	133 128 125	111 107 104	17 16 15
61	86 85	115 114	96 95	12 11	**61**	89 87	119 116	99 97	14 13	**61**	93 90	123 120	103 100	16 15
60	83 83	110 110	92 92	12 11	**60**	84	112	93	13	**60**	86 85 85	115 114 113	96 95 94	16 15 14
59	79 78	106 104	88 87	11 10	**59**	80 80	107 107	89 89	13 12	**59**	81 81	108 108	90 90	15 14

BOYS—Continued

TALL SLENDER TYPE					AVERAGE TYPE					SHORT STOCKY TYPE				
HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE	HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE	HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE
	Underweight	Overweight				Underweight	Overweight				Underweight	Overweight		
(Inches)	Under	Over	Normal Weight	(Yrs.)	(Inches)	Under	Over	Normal Weight	(Yrs.)	(Inches)	Under	Over	Normal Weight	(Yrs.)
58	76	101	84	11	**58**	76	102	85	12	**58**	78	103	87	15
	76	101	84	10							77	103	86	14
											76	102	85	13
57	72	96	80	10	**57**	73	97	81	12	**57**	75	100	83	14
						73	97	81	11		74	98	82	13
56	69	92	77	10	**56**	69	92	77	12	**56**	70	94	78	14
	68	91	76	9		69	92	77	11		70	94	78	13
55	65	86	72	9	**55**	66	88	73	11	**55**	67	89	74	13
						66	88	73	10		67	89	74	12
54	63	84	70	9	**54**	63	84	70	10	**54**	64	85	71	13
	63	84	70	8							64	85	71	12
											63	84	70	11
53	60	80	67	8	**53**	60	80	67	10	**53**	61	82	68	12
						60	80	67	9		60	80	67	11
52	58	77	64	8	**52**	58	77	64	9	**52**	58	77	64	11
	57	76	63	7							58	77	64	10

51	55	73	61	7	**51**	55 55	73 73	61 61	9 8	**51**	55 55	73 73	61 61	11 10
50	52 51	70 68	58 57	7 6	**50**	52	70	58	8	**50**	52 52	70 70	58 58	10 9
49	49	66	55	6	**49**	49 49	66 66	55 55	8 7	**49**	49 49	66 66	55 55	10 9
48	47	62	52	6	**48**	48	64	53	7	**48**	48 48	64 64	53 53	9 8
47	44	59	49	5	**47**	45 45	60 60	50 50	7 6	**47**	45 45	60 60	50 50	9 8
46	42	56	47	5	**46**	43	58	48	6	**46**	43 43	58 58	48 48	8 7
					45	41 41	55 55	46 46	6 5	**45**	41 41	55 55	46 46	8 7
					44	40	52	44	5	**44**	40 40	53 53	44 44	7 6
										43	37 37 37	49 49 49	41 41 41	7 6 5
										42	35	47	39	6
										41	34 34	45 45	38 38	6 5

GIRLS

TALL SLENDER TYPE					AVERAGE TYPE					SHORT STOCKY TYPE				
HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)	HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight Under	WEIGHT (Lbs.) Overweight Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)
69	128	170	142	18										
	126	168	140	17										
	124	166	138	16										
68	124	166	138	18										
	124	166	138	17										
	122	163	136	16										
	121	162	135	15										
	120	160	133	14										
67	121	162	135	18										
	120	160	133	17										
	120	160	133	16										
	118	157	131	15										
	117	156	130	14										
66	117	156	130	18										
	116	155	129	17										
	115	153	128	16										
	112	150	125	15										
	112	149	124	14										
	112	149	124	13										

65	110 109 108	146 145 144	122 121 120	15 14 13	**65**	113 112 111	151 150 148	126 125 123	18 17 16					
64	103 103	138 137	115 114	13 12	**64**	111 110 108 107 105	148 146 144 143 140	123 122 120 119 117	18 17 16 15 14					
63	99 99	132 132	110 110	13 12	**63**	108 107 105 104 101	144 143 140 139 134	120 119 117 116 112	18 17 16 15 14					
62	94	126	105	12	**62**	102 98 95	136 131 127	113 109 106	15 14 13	**62**	106 105 103	142 140 138	118 117 115	18 17 16
61	90 89	120 119	100 99	12 11	**61**	94 91	126 121	105 101	14 13	**61**	104 102 101 97	139 136 134 130	116 113 112 108	18 17 16 15
60	85 85	114 114	95 95	12 11	**60**	87	116	97	13	**60**	100 98 97 94 91	133 131 130 126 121	111 109 108 105 101	18 17 16 15 14

GIRLS—Continued

TALL SLENDER TYPE

HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight — Under	WEIGHT (Lbs.) Overweight — Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)
59	81	108	90	11
	78	104	87	10
58	77	103	86	11
	76	101	84	10
57	74	98	82	10
56	70	94	78	10
	68	91	76	9
55	67	89	74	9
	65	86	72	8
54	63	84	70	9
	62	83	69	8

AVERAGE TYPE

HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight — Under	WEIGHT (Lbs.) Overweight — Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)
59	83	110	92	13
	81	108	90	12
58	77	103	86	12
57	74	98	82	12
	74	98	82	11
56	71	95	79	12
	70	94	78	11
55	67	89	74	11
	67	89	74	10
54	64	85	71	11
	63	84	70	10

SHORT STOCKY TYPE

HEIGHT MEASURING SCALE (Inches)	WEIGHT (Lbs.) Underweight — Under	WEIGHT (Lbs.) Overweight — Over	WEIGHT (Lbs.) Normal Weight	AGE (Yrs.)
59	93	123	103	16
	90	120	100	15
	86	115	96	14
58	86	115	96	15
	84	112	93	14
	79	106	88	13
57	79	106	88	14
	76	101	84	13
56	75	100	83	14
	73	97	81	13
55	69	92	77	13
	67	90	75	12
54	66	88	73	13
	64	85	71	12

53	60	80	67	8	**53**	61 60	82 80	68 67	10 9	**53**	62 61	83 82	69 68	12 11
52	58 57	77 76	64 63	8 7	**52**	58 58	77 77	64 64	10 9	**52**	60 58	80 78	67 65	12 11
51	53	71	59	7	**51**	55 54	73 72	61 60	9 8	**51**	58 57 55	78 76 73	65 63 61	12 11 10
50	50 50	67 67	56 56	7 6	**50**	51	68	57	8	**50**	55 53 52	73 71 70	61 59 58	11 10 9
49	49 49	65 65	54 54	7 6	**49**	49	66	55	8	**49**	50 49	67 66	56 55	10 9
48	47	62	52	6	**48**	47	62	52	7	**48**	48 47 47	64 62 62	53 52 52	10 9 8
47	45 44	60 59	50 49	6 5	**47**	45	60	50	7	**47**	45 45	60 60	50 50	9 8
46	42	56	47	5	**46**	42 42	56 56	47 47	7 6	**46**	43 43	58 58	48 48	9 8

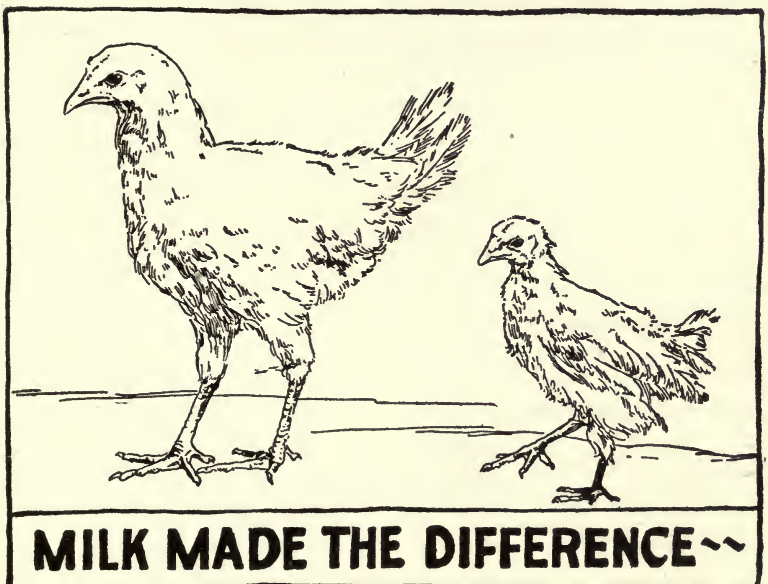
GIRLS—Continued

TALL SLENDER TYPE					AVERAGE TYPE					SHORT STOCKY TYPE				
HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE	HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE	HEIGHT MEASURING SCALE	WEIGHT (Lbs.)			AGE
	Underweight	Overweight	Normal Weight			Underweight	Overweight	Normal Weight			Underweight	Overweight	Normal Weight	
(Inches)	Under	Over		(Yrs.)	(Inches)	Under	Over		(Yrs.)	(Inches)	Under	Over		(Yrs.)
45	40	54	45	5	**45**	40	54	45	6	**45**	40	54	45	8
											40	54	45	7
44	38	50	42	5	**44**	38	50	42	6	**44**	38	50	42	7
					43	37	49	41	5	**43**	37	49	41	7
											37	49	41	6
					42	35	47	39	5	**42**	35	47	39	7
											35	47	39	6
										41	33	44	37	6
											33	44	37	5
										40	32	43	36	5

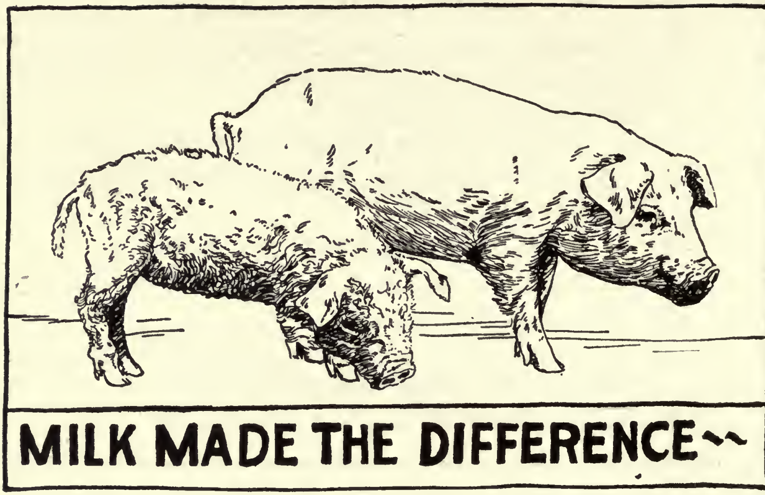
*Reprinted through the courtesy of the Director of Physical Education, Philadelphia Public Schools. Copies of this chart mounted on cardboard, suitable for tacking on the wall, can be procured from him at the following rates: 100 or over, 50c each; 50 to 100, 75c each; less than 50, $1.00 each.

WHY DRINK MILK?

1. It makes you grow. It is nature's food for the young, and is especially good for babies and children.
2. It makes strong bones and good teeth.
3. It contains iron. Iron is needed to make good rich blood.
4. It helps to build up strong muscles.
5. It supplies power and heat to the body.
6. It is easy to digest.
7. It is easy to take. It "tastes good" and can be used in many different ways.
8. It is a perfect food, a "balanced" food.



COURTESY OF THE NATIONAL DAIRY COUNCIL, CHICAGO, ILL.



COURTESY OF THE NATIONAL DAIRY COUNCIL, CHICAGO, ILL.

"These two little pigs didn't 'go to market,' but one of them will soon be ready while the other will surely find trouble in finding a buyer.

"These pigs are the same age, in fact of the same litter and were fed the same ration except that the smaller one received no milk after he was weaned. He had all the other food he could eat, same as the big one. At the conclusion of the experiment, the larger pig weighed 42 pounds and 3 ounces, while the smaller one weighed 13 pounds and 5 ounces.

"Do not drink milk—EAT it slowly"

abdomen (ăb dō′mĕn)
absorption (ăb sôrp′shŭn)
adenoids (ăd′ē noid)
alimentary canal (ăl ĭ mĕn tȧ r kȧ năl′)
alkali (ăl′kȧ lī)
amoeba (ȧ mē′bȧ)
antiseptic (ăn tĭ sĕp′ tĭk)
antitoxin (ăn ti tŏk′sĭn)
aorta (ā ôr′tȧ)
artery (är′tẽr ĭ)
auricle (ô′rĭ k′l)
bacteria (băk tē′rĭ ȧ)
biceps (bī′sĕps)
bile (bīl)
bronchial, tube (brŏn′kī ăl)
callous (kăl′ŭs)
calory (kăl′ô rĭ)
capillary (kap′ĭ lȧ rĭ)
carbohydrate (kär bô hī′ drāte)
carbondioxide(kär′bŏn dīŏk′sīd)
cartilage (kär′tĭ lāj)
cell (sĕl)
cereal (sē′rē ăl)
cerebellum (sĕr ē bĕl′ŭm)
cerebrum (sĕr′ē brŭm)
clot (klŏt)
coagulation (kô ăg ū lā′shŭn)
cochlea (kŏk′lē ȧ)
combustion (kŏm bŭst′chŭn)
community (kŏ mū′nĭ tĭ)
constipation (kŏn stī pā′shŭn)
contagious disease (kŏn tā′jŭs)
cornea (kôr′nē ȧ)
corpuscles (kôr′pŭs′lz)
dentine (dĕn′tĭn)
dermis (dŭr′mĭs)
diaphragm (dī′ȧ frăm)
digestion (dĭ jĕs′chŭn)
emetic (ē mĕt′ĭk)
epidermis (ĕp ĭ dŭr′mĭs)
esophagus (ē sŏf′ȧ gŭs)
Eustachian tube (ū sta′kĭ ăn)
evaporation (ē văp ô rā′shŭn)
excretion (ĕks krē′shŭn)
expiration (ĕk spĭ rā′shŭn)
fatigue (fȧ tēg′)
fibrin (fī′brĭn)
focus (fō′kŭs)
follicle (fŏl′ĭ k′l)
gastric juice (găs′trĭk jo͞os)
hydrochloric acid (hī drô klō rĭk ăs′ĭd)
hydrophobia (hī drô fō′bĭ a)
immunity (ĭ mū′nĭ tĭ)
inspiration (ĭn spĭ rā′shŭn)
intestine (ĭn tĕs tĭn)
iodine (ī′ô dĭn)
iris (ī′rĭs)
lacteal (lăk′tē ăl)
larynx (lăr′ĭnks)
ligament (lĭg′ȧ mĕnt)
lymphatic (lĭm făt′ĭk)
malaria (mȧ lā′rĭ ȧ)
malnutrition (măl′nū trĭsh′ŭn)
marrow (măr′ō)
medulla (mē dŭl′ȧ)
menu (mĕn′ū, mā′nū)

microbe (mī′krōb)
microscope (mī′krȯ skōp)
narcotic (när kŏt′ĭk)
nicotine (nĭk′ȯ tĭn)
nutrition (nū trĭsh ŭn)
optic nerve (ŏp′tĭc nûrv)
oxygen (ŏk′sĭ jĕn)
pancreatic juice (pan krē ăt′ĭk jōōs)
pasteurize (pȧs′tẽr īz)
periosteum (pĕr ĭ ŏs′tē ŭm)
plasma (plăz′mȧ)
pore (pōr)
protein (prō′tē ĭn)
protoplasm (prō′tȯ plăz′m)
protozoa (prō tȯ zō′ȧ)
pulp (pŭlp)
pulse (pŭls)
pus (pŭs)
respiration (rĕs pĭ rā′shŭn)
retina (rĕt′ĭ nȧ)
saliva (sȧ lī′vȧ)
salivary glands (săl′ĭ vā rĭ glănds)
serum (sē′rŭm)
sterilize (stĕr′ĭ līz)
stomach (stŭm′ŭk)
tendon (tĕn′dun)
tissue (tĭsh′ū)
tonsil (tŏn′sĭl)
toxin (tŏk′sĭn)
trachea (trā′kē ȧ)
tuberculosis (tū bûr′kū lō′sis)
vaccine (văk′sĭn)
vaccination (văk′ sĭ nā′shŭn)
vein (vān)
ventilation (vĕn tĭ lā′shŭn)
ventricle (vĕn trĭ′k′l)
vertebrae (vûr′tē brȧ)
villi (vĭl′ī)
vitamin (vī′tȧ mĭn)